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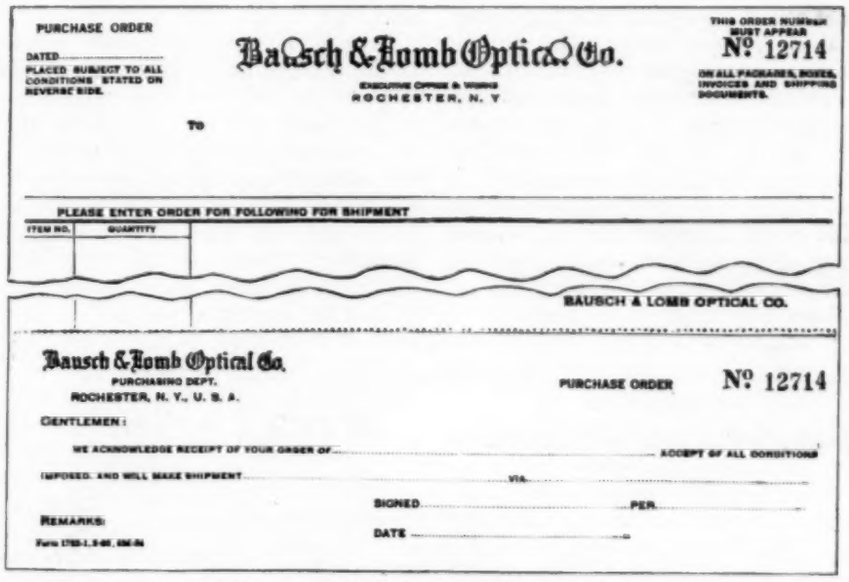
Planning for Better Forms

By August J. Zimmerman

ALMOST every action in business concerns of today is either initiated by, or the results recorded by something in writing, and is usually accomplished through the medium of printed forms. The designing of these forms to provide for simplicity and economy is a consideration of primary importance, and has a vital bearing on the efficiency with which the routine of the business is carried on.

When the need for a form arises in the shop the design, in most cases, is left in the hands of a subordinate executive or even a clerk. At the plant of the Bausch & Lomb Optical Co., a centralized control was established, which produced the proper results, and made for better and more efficient forms. As these form requirements came up at frequent intervals, it was essential that an accurate analysis of the problem be made, and the exact requirements which the form must meet be completely determined. Prior to the change, the outstanding points, in most cases, were assembled in the best manner suggesting itself at the time and a supply printed up.


PURCHASE ORDER

DATED.....
PLACED SUBJECT TO ALL CONDITIONS STATED ON REVERSE SIDE.

Bausch & Lomb Optical Co.
EXECUTIVE OFFICE & WORKS
ROCHESTER, N. Y.

THIS ORDER NUMBER MUST APPEAR
No. 12714
ON ALL PACKAGES, BOXES, INVOICES AND SHIPPING DOCUMENTS.

TO

PLEASE ENTER ORDER FOR FOLLOWING FOR SHIPMENT

ITEM NO.	QUANTITY	

BAUSCH & LOMB OPTICAL CO.

Bausch & Lomb Optical Co.
PURCHASING DEPT.
ROCHESTER, N. Y., U. S. A.

PURCHASE ORDER No. 12714

GENTLEMEN:

WE ACKNOWLEDGE RECEIPT OF YOUR ORDER OF..... ACCEPT OF ALL CONDITIONS IMPOSED. AND WILL MAKE SHIPMENT..... VIA.....

SIGNED..... PER.....

REMARKS:

DATE.....

Fig. 1—Original of purchase order

There are essential elements to be followed in planning a form, but it is rare that every one will receive proper consideration, unless the person designing the forms keeps a list of these points before him to make the necessary check. The purpose for which the form is intended should be defined clearly, and then all the information which the form must record in order to fulfill its purpose should be listed carefully. The next process is to establish the proper sequence of the information so that the most desirable positions can be assigned to important elements, and all arranged for ease of recording or consultation.

Forms serving similar or related purposes should be investigated and an effort made to combine them where possible. The amount of space necessary for the proper entry of information should be determined. The headings and type should also be layed out to emphasize properly the important points. The most satisfactory size to take care of the information necessary, and to cut most economically from standard sizes of paper should next be determined. The grade of paper is also important, and should be such as to insure permanency of record, clear impression, and creditable appearance.

Finally, on the face of each form brief instructions showing its proper use should be incorporated. New forms should originate in the department where the need first appears. The department head should be held responsible for submitting as complete a copy as possible, showing what he wishes the form to include, and incorporating his ideas as to arrangement. Upon its submission for approval, the form should be analyzed in order to ascertain what it is expected to accomplish, whether or not it is needed, and how well it accomplishes its purpose. In many cases it will be found that a study of the form will bring out the fact that as drawn up it is entirely inadequate. In such cases it should be referred back to the department head, and in co-operation with him, a new form drafted. In other cases, investigation of the proposed form will disclose the fact that another form already in existence will serve the same purpose, or by combining certain forms the purpose may be fulfilled without the necessity of developing a new form. The revised copy should be submitted to all department heads interested for their final approval.

On all reprints the opportunity should be taken to investigate the form along somewhat similar lines as

though it were a new form. In addition, a study should be made to determine whether or not the form is misused. Often, especially with old forms, they may be used for other purposes than that for which they were intended, or the wrong form may be used. In other cases an extraordinarily large use of forms may bring to light certain inefficiencies in the work which have passed unnoticed.

The determination of the quantity to be printed is an important matter that comes up in connection with the printing of every form. No general rule can be made that will cover all instances. However, practical experience has shown that in most cases it is not economical to print less than a sixty days' supply. Set up is one of the principal elements of printing cost, and it frequently costs but little more to print a large supply of forms than it would the few that would be required for a sixty days' supply. This is not so true of forms used in large quantities, and the point of minimum investment in stock should also be considered.

The first thing to do in any plant in order to ascertain the prevailing conditions, and possibly as a preliminary to the organization of a centralized control of forms, is to make an investigation along the following lines: Are the sizes of the present forms larger than are necessary for the work to be covered? Could some of the forms be re-worded to cut down on the extra runs on the presses? Would colors answer for the duplicates and triplicates instead of printing these titles on the forms, thus saving extra runs of the presses? Could some of the forms be printed on cheaper paper and still answer the purpose? Could forms used in certain departments be used in others? Could some forms be combined with others by making minor changes?

It is important that the one person who passes on all forms should issue the printing orders as well, besides keeping an inventory of stock on hand. It is essential, therefore, that a person familiar with the system of the organization be placed in charge of the work.

In carrying out this plan of organization the Bausch & Lomb Optical Co., was able to make changes which reduced the personnel and made possible reductions in cost and savings in time. The purchasing order form presents a problem that is common to all plants, and in Fig. 1 is shown the original of a purchase order which was worked out to cover the requirements. In Fig. 2 is shown the form used for the duplicate, triplicate, and quadruplicate. A feature of the original is that it contains a reply slip to be mailed back by the firm from which the purchase is made. The other copies contain spaces on the front and back for delivery entries against twelve items which might be purchased on the order.

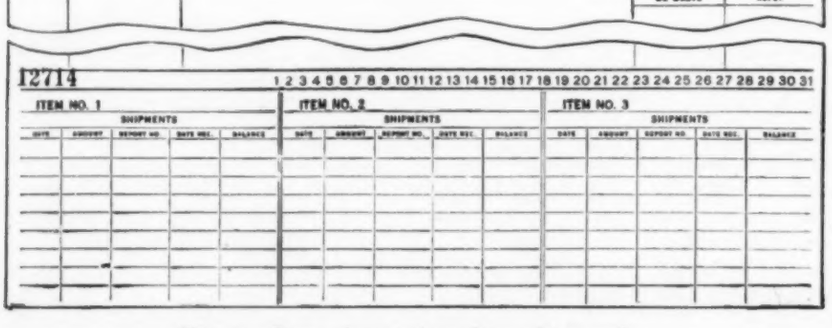

PURCHASE ORDER
DATED .....
PURCHASING DEPT. COPY
Bausch & Lomb Optical Co.
EXECUTIVE OFFICE AND WORKS
ROCHESTER, N. Y.
No 12714
NOTIFY .....
DELIVER TO .....
CUSTOMER .....
USED FOR .....
ITEM NO. | QUANTITY | CLASSIFICATION
WE WROTE | REPLY
12714
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
ITEM NO. 1 SHIPMENTS
ITEM NO. 2 SHIPMENTS
ITEM NO. 3 SHIPMENTS

Fig. 2—Form for copies of purchase order

Wages Are Not All

BY JOHN HOMEWOOD

MUCH has been said and written about the wages all-round machinists as compared with those of bricklayers, plasterers, and hod carriers. What first-class machinist, who is interested in the science of his trade and who muses and plans even outside of regular working hours until the hand of Morpheus has him in its grasp, would trade places with any one of the above mentioned tradesmen? Furthermore, fellow machinists, who in "the basement of Medicine Hat" would like to be a hod carrier after wielding a pair of calipers?

True it is that the hourly remuneration is greater in any of the above alternative lines of endeavor, but it must be realized that employment for such work is spasmodic and at times made anything but pleasant by inclement weather. Reflect a moment and weigh the value of apparently steady work under almost ideal conditions as compared with the pangs of the bricklayer and the almost torturing circumstances of a plasterer. Wages of the first-class machinist are, no doubt, lower than they should be; but they are controlled by economic conditions. Since his work is of such a nature as to keep him fascinated with it, the machinist goes on day after day apparently satisfied with his lot. He seems to get a kick out of a job well done; he thrills at the feel of a caliper fit or a well set-up job; he seems to get joy out of everything he does when producing first-class work; he is happy at his work and is never subjected to the monotonous repetitive work that must stare the other class of tradesmen in the face every day. When on the job the plasterer works every minute of his time excepting those few necessary relaxation moments. If there is a machinist who aspires to be a plasterer, let him wield the gray mud for one hour and he will soon be entirely out, or all in, either way he wants to put it. If there is a machinist who is ambitious to carry the hod, let him creak under its burdening load for half that time and then prepare for his physical demise and mental contrition. He will, in ninety-nine cases out of a hundred, slink back to the old game with canine facility: figuratively referring to Fido's appendage.

Backlash Eliminator

A mechanical device that is vital to the functioning of the Bethlehem torque amplifier and has many other applications

THE principle of the Bethlehem lashlock (Nieman patents) was discovered by an engineer of the Bethlehem Steel Company during the construction of a heavy-duty machine (the torque amplifier, described in the last issue) in which it was particularly desirable that there should be no backlash. Development of the original idea has shown that it can be successfully applied to a wide range of machinery, from large mechanisms involving great forces to small and delicate instruments. The lashlock operates to eliminate backlash in gearwheels, feed screws, end-thrusts, bearings —practically wherever play occurs between moving members. It also compensates for wear, and automatically relieves strain caused either by tight setting or expansion due to heat. Action of the lashlock is positive, without slip or yielding under load, and it in no way lessens the power which can be transmitted or weakens the members to which it is applied. Entirely automatic, it never requires hand adjustment, and needs only the minimum of lubrication.

The basic principle of the lashlock will be seen from Fig. 1. A wedge-shaped member, *A*, slides on a stem, *B*, and is urged downward by the light spring *C*. Two rollers, *D* and *E*, are disposed so that they press against the wedge, as shown. It is obivous that if both rollers press simultaneously against the wedge it will be forced upwards, readily overcoming the pressure of the light spring. What may not be so obivous at first glance is

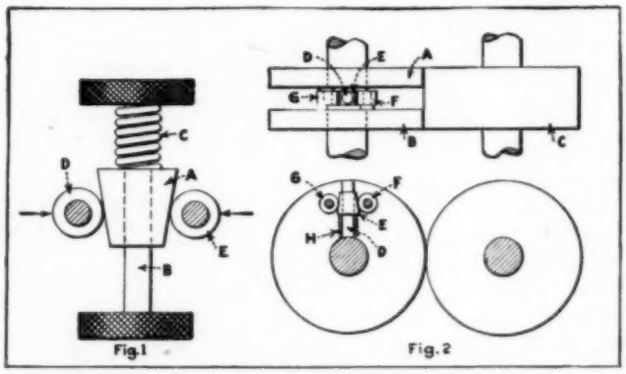


Fig. 1—Wedge type of lashlock. Fig. 2—Lashlock applied to split gears

that, with the slope of the wedge approximately as shown (5 deg. to 10 deg. on each side of the axis), if only one roller is pressed against the wedge the friction between the wedge and stem will be greater than the upward force imparted to the wedge, and the wedge will bind upon the stem. All the force applied to the single roller will thus be imparted to the member which supports the stem, forcing it in the direction in which the roller presses. This binding or locking effect will occur no matter how great the force applied to the single roller, as the proportion between the friction on the stem and the upward force imparted to the wedge remains the same. When both rollers are pressed simultaneously, however, the pressures are balanced and no friction results between wedge and stem; thus all the force applied to the two rollers is brought to bear on moving the wedge upward.

From this examination it is seen that the lashlock

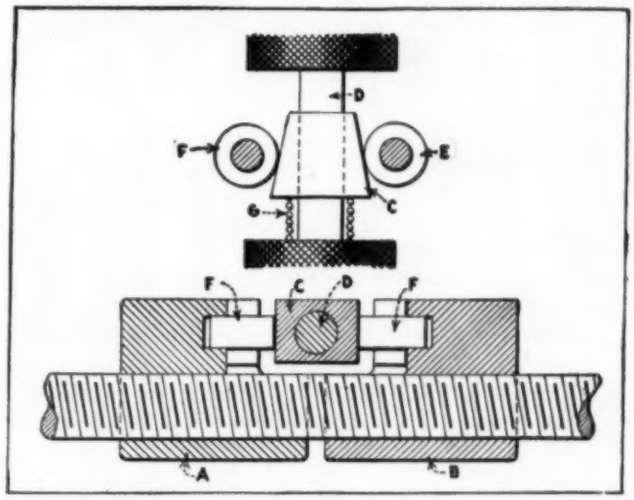


Fig. 3—Wedge lashlock applied to leadscrew

depends upon two things: a frictional locking when only one roller is pressed; and a complete release when both rollers are pressed simultaneously.

Application of the above working principle to mechanical movements can be accomplished in a variety of ways, provided the essential elements are always included. Take, for example, a pair of gearwheels, a mechanical combination notorious for backlash — in which, as a matter of fact, a certain amount of backlash has always had to be allowed for in the design and setting. Several methods have been used to mitigate the backlash in gears, perhaps the most widely known being the "split" gear, where two gears are mounted side by side on the same shaft, one gear keyed to the shaft and the other free to turn. Both of this split pair mesh with a single solid gear mounted and keyed on a second shaft. The split pair is provided with a spring which tends to rotate the free gear, causing the teeth of the split gear to pinch the teeth of the single-gear element with which they mesh. With a split gear one of the split pair performs the drive in one direction, the other in the opposite direction, and it will be seen that the torque in one direction is positively transmitted, while in the other direction it depends upon the strength of the spring. This fact limits the use of split gears to

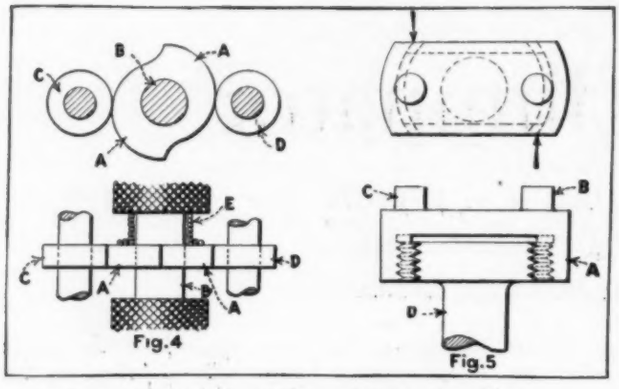


Fig. 4—Double involute cam lashlock. Fig. 5—Threaded type of lashlock

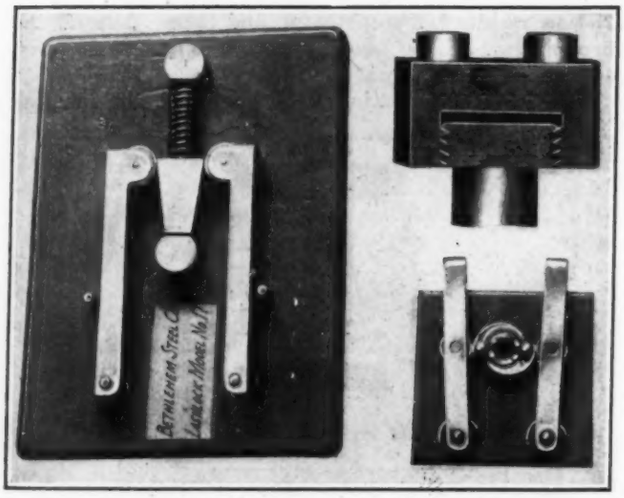


Fig. 6—Three forms of wedge used in the lashlock. Straight-sided, double cam, and "T" or screw type

mechanisms through which only small forces are transmitted, for if the strength of the spring be increased the pinching of the teeth will become excessive, producing wear and strain. Incorporating the lashlock in a split gear, however, transforms it from a weak element with a narrow range of usefulness into a strong, positively-acting element capable of being widely applied to both light and heavy duty machinery.

In Fig. 2 is illustrated, diagrammatically, the lashlock principle on a split-gear element. *A* and *B* are the split members, meshing with the solid gear *C*. Stem *D* is attached rigidly to the shaft which carries the split pair, and on the stem is mounted the wedge member *E*. Rollers *F* and *G* are attached respectively to gears *A* and *B*. A light spring *H*, is mounted so as to urge the wedge away from the shaft, thus urging apart the rollers *F* and *G*, and through them imparting rotational urge, though in opposite directions, to the gears *A* and *B*.

The wedge will be pushed outward until the teeth on gears *A* and *B* lightly pinch the teeth of gear *C*; this may be termed the "normal" position of the wedge. There are only two circumstances which can cause the wedge to change from this normal position: either both of the rollers *G* and *H* press on it simultaneously, or both simultaneously relieve their pressure. Pressure of only one roller will cause binding friction of wedge on stem; therefore, when gear *C* begins to drive it will cause one of the split pair to exert pressure on its respective roller and so on one side of the wedge; thus the driving force of *C* will be transmitted to the stem and so to the shaft which carries the split pair. (Gear *C* may, of course, be the driven gear). If *C* reverses the direction of its drive the other roller will press against the wedge and the shaft driven oppositely. There will be no instant when neither roller is exerting pressure on the wedge, and no instant when both rollers are pressing simultaneously.

All this is true provided the teeth on all the gears are accurately cut. If they are of different size, through inaccurate cutting or wear, a thick tooth will urge the rollers together and move the wedge outward, while a thin tooth will permit the spring to push the wedge inward and cause the split pair to pinch a little more closely. It must be remembered that the pinching is always a light force, because the spring which urges the wedge outward need be only of light force—practically negligible compared with the other forces involved—for the lashlock action is through positive frictional locking and bears no relation to the strength of the spring employed on the wedge. In the non-lashlock type of split gear the pinching is necessarily always comparatively severe because the spring must be heavy enough to take the full load of the drive in one direction. It will easily be understood, then, how by this accommodating inward and outward movement of the wedge all irregularities of the teeth are compensated for, that the action is immediate and automatic, and that the teeth never are put under strain.

In case, through lack of lubrication, the wedge should tend to stick on its stem, the outward push of the rollers would overcome such friction without subjecting the gears to any considerable strain; the only result of sticking is failure of the spring to push the wedge inward, which means that the backlash would not be adequately eliminated.

The diagram does not give an actual idea of the construction of a set of lashlock gears. The lashlock requires but little space, and need not be set inside the gears at all. It has been positioned, for instance, on a handwheel on the end of a shaft a foot or more from any of the gears. It will be readily understood, also, that one lashlock may eliminate backlash from a train of gears, or from a combination of gears, worms, racks,

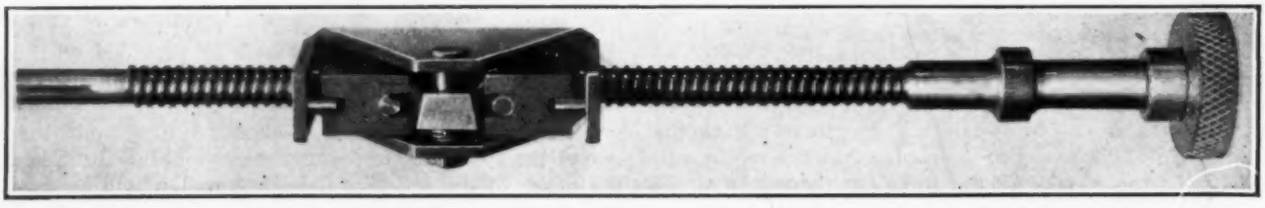


Fig. 7—Lashlock on a screw-feed. Positive drive is obtained in both directions with backlash during reverse of direction, less than 0.0001 in. of carriage travel

etc., provided that the gearing is doubled, one set for driving in each direction.

Application of the lashlock to a screw-feed is illustrated in Fig. 3. Here the same scheme is followed as with the gearing. Two nuts, *A* and *B*, run on a screw-shaft. The wedge, *C*, is mounted on a stem, *D*, which is supported by the housing of the driven member, while rollers *E* and *F* are attached to nuts *B* and *A* respectively. The wedge as it is pressed forward by the spring, *G*, urges the nuts apart. When the screw-shaft is turned in one direction one of the nuts forces its roller against one side of the wedge, a frictional binding is created, and through the stem the drive is transmitted to the driven member. Reversal of the screw-shaft produces a drive through the other nut, in the opposite direction. There is no lost motion during the reversal, nor can any binding due to unevenness of the threads on either screw-shaft or nuts strain the members.

Screws usually become worn irregularly because one portion is used more than the rest. This fact makes it impossible to set a fixed adjustment for the sake of taking up backlash in the worn portion, since this would cause binding and strain when the nut traveled from the worn to the newer portion. The lashlock, however, will take up the backlash in the loose portion and nevertheless work freely in the tight portion, adjustment occurring automatically. It must be noted, however, that if the nut travels from the newer portion to the worn portion, without any reversal being made during this travel, and if reversal is then made while the nut is entirely on the worn portion, there will be detectable a certain amount of play during the moment of reversal while the wedge is adjusting itself, since the spring cannot push the wedge downward until pressure is relieved. At first sight this would seem to limit the accuracy of the device in screw-feeds, but this is true to only a limited extent, for the lashlock always takes a central position and therefore averages irregularities in threads and gear teeth; so that in moving from a new to a worn portion the over-all error will only be half as great as it would be with a fixed adjustment perfectly set for the newer, unworn portion. In the extremest cases the action of the lashlock is superior to the ordinary method of hand setting, which is to take up all the backlash on one side. In the ordinary operation of the machine the above described effect is no drawback at all.

Applied to a piece of machinery—as the cross-feed of a lathe—the lashlock screw-feed makes it entirely unnecessary to turn the feed handle backward a fraction of a revolution in order to take up backlash. If a machinist overfeeds his carriage half-a-thousandth of an inch, he can correct the error by moving the carriage back a half-thousandth and stopping there—he will then be set with absolute accuracy, and his carriage will be held at that point positively, with no tendency for the tool to jump forward into soft spots in the work. In the vertical feed of a planer the same precision of feed results and, further, the tool will not drop down when riding over a hole in the work or at the end of each back-stroke, both of which are sources of chatter. The same beneficial effect occurs with the feed of a grinder. In actual construction the lashlock is combined with a feed-screw in a compact design of great strength.

For thrust bearings—to eliminate end-play in a shaft—the lashlock installation is similar to that in a feed-screw, with the threads and nuts replaced by collars.

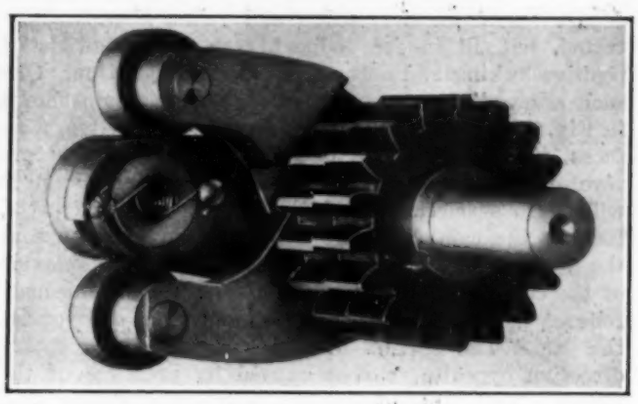


Fig. 8—Pinion, with lashlock of double cam type. The pinion is split, one-half driving in each direction. Lashlock mechanism may be positioned at a distance from pinion, or in case of a large gear, wholly within periphery of teeth

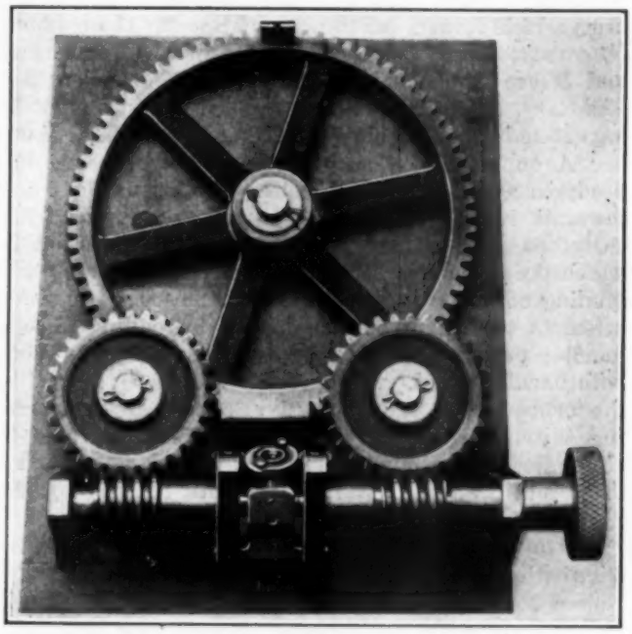


Fig. 9—Model of gun drive gearing. Backlash in the large gear during a reversal of direction of the knob, is less than six seconds of arc

Two collars are keyed to the shaft a slight distance apart; two other collars are mounted inside the first two, kept from revolving with the shaft but permitted a small endwise movement. Each of these two inside collars carries a roller so mounted as to press against a side of the wedge, the stem of which is attached to the fixed support which bears the thrust. The spring will then urge the inside collars outward against the collars fixed on the shaft; the shaft will not be able, of course, to move endwise in either direction because to do so would mean moving the wedge by pressure on only one roller. Bearing metal is set between the collars and lubrication effected as usual. As the bearings wear, the wedge works inward, taking up this wear and holding the shaft always in the same position, endwise, as at the start.

Great flexibility is possible in designing the lashlock to meet situations, for the principle is capable of an astonishing variety of forms, some of which appear to

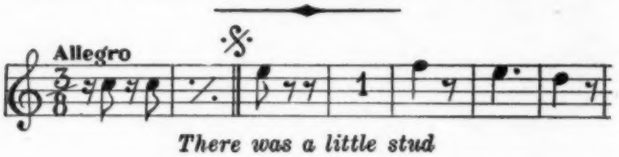
depart far from the wedge and roller already illustrated, but all in fact adhering to the essentials of positive locking and automatic release of friction. One such alternative construction is the double cam shown in Fig. 4. Here a double cam replaces the wedge, with faces *AA*; the stem, *B*, is a pivot on which the cam revolves. Pressure of either one of the rollers *C* and *D* will cause a frictional locking between cam and pivot, because the cam faces are cut on an involute so that the pressure of the rollers is always a little to one side of the center. Pressure of both rollers simultaneously relieves the friction between cam and pivot and rotates the cam. The spring, *E*, urges the cam in a rotary direction opposite to that caused by pressure of the rollers. This form of lashlock is interchangeable with the straight-sided wedge, but fits better into certain constructions.

Another form of lashlock is that shown in Fig. 5. Here the place of the wedge member is taken by a member, *A*, of the shape shown. This is provided with two lugs, *B* and *C*, and with two downwardly-projecting arms which form a partial cap embracing the member *D*, corresponding to the stem of Fig. 1. Members *A* and *D* are threaded into each other. No rollers are necessary. Simultaneous pressure on opposite sides of lugs *B* and *C*, as indicated by the arrows, rotates member *A* on member *D*; but pressure on only one lug produces a cocking effect, causes a frictional lock and prevents rotation. All the pressure on the one lug therefore acts to move the stem in the direction in which the lug delivers the pressure. This cocking and binding effect is the same thing that occurs when one attempts to open a bureau drawer by pulling on one handle; pressure on both lugs corresponds to pulling both handles together. This form of lashlock is used in the torque amplifier, or in any type of mechanism operating through friction bands, where it is desirable to eliminate backlash when reversal occurs between one drum and its oppositely rotating mate. It has not the high degree of accuracy of other forms.

As to the accuracy of the lashlock, while backlash elimination between moving members, by positive means, cannot be theoretically absolute, this theoretical play is insignificant with the lashlock. Severe tests have been made to determine this point. For example, a train consisting of worms and gears (all stock parts) was arranged to give a reduction of 200 to 1 and the angular movement of the primary drive gear and that of the final driven gear measured during a reversal of direction. The backlash of the driven gear was found to be less than $\frac{1}{10}$ part of a minute of arc, which is entirely negligible. Gearing in this test was fairly heavy, designed to transmit 30 lb.-ft. of torque. Similar tests were made on a screw-feed, the screw used being one removed from the cross-feed of a lathe because of excessive wear. A carriage was mounted on this screw and its cross movement measured during reversal of direction of the feed-handle. Backlash was found to be well within one ten-thousandth of an inch of carriage travel. Initial accuracy of gear teeth and screw threads is not, of course, bettered by the lashlock although, because of the double drive, inaccuracies are halved, or at least averaged.

The lashlock can be applied to gears, screws, bearings, thrusts, linkage motions, sliding parts and frictionally driven parts, as shown in Figs. 6-9. In some machinery the space required for its installation may prove an obstacle; because of its adaptability, however, and the variety of forms which it can assume, it is usually easy to incorporate it in a design.

The lashlock is applicable to two general classes of machinery: those in which great accuracy is the chief factor, such as certain machine tools, precision instruments and fire control apparatus; and machines where the elimination of backlash will result in the production of better work and in prolonging the life of the machine by reducing the wear arising from looseness and chatter.



There was a little stud

Autobiography of a ¾-In. Stud

BY J. B. WHATLEY

I WAS one of a large number of studs cut from a bar valued at about $1.14, which, I'll admit, doesn't sound so big. A man cut us off at a cost of nearly 3½c. each and, since we were worth about 6½c. apiece before birth, the operation made us worth approximately 9½c. each, at an early stage of life. We were dropped on the ground and another man came along and picked us up, one at a time, threw us into a truck, and carried us a short distance to where we were unloaded, one at a time, on the ground beside a building. At this location we represented about 12½c. each. After we had lain on the ground for a few hours another man came over, carefully picked us up, one at a time, carried us inside the building, and laid us on the end of a machine that was to perform another operation on us to make us of some use. By that time our value had increased to about 13½c. apiece. The man who ran the machine was very kind to us. He picked us up, one at a time, and laid us on the end of the operating table. After he had operated on each of us we were ready for service in the world and were worth nearly 20c. each. The operator of the machine, however, was not so considerate of our feelings after he had completed his work: he threw us down on a concrete floor and damaged some of us severely; in fact four of us had to be operated on a second time and, due to this, we represented about 22½c. each.

Later we were hauled in a motor truck quite a distance and a couple of the family succeeded in escaping and hiding out alongside the road. They were never found, and it was necessary to go through the whole process again to replace the lost members of the family. We finally landed at a spot about 100 ft. from where we were to spend the rest of our days, and were thrown on the ground, each at maturity worth about a quarter of a dollar. After lying on the ground for several days we became coated with a reddish substance called rust, and when we were later forced into our permanent home some of us screamed with pain, in fact it was impossible to get some of the boys to enter the innermost parts of the home, and they lived in and out for the remainder of their lives.

So, you see, being born of cheap parents, and being mistreated in your childhood does not necessarily make you cheap: it really makes you very high-priced.

Moral: Use tote boxes and protect material.

Applying Electrical Equipment to Production Machinery

By Robert Corey Deale
Electrical Engineer, Niles-Bement-Pond Co.

Complete flexibility in grinding machines given by electrical control—Motor drive for miscellaneous equipment—Proper balance between motor characteristics and flywheel for power presses

GRINDING machines include many different types, but the most important are the cylindrical grinding machines, the surface grinding machines, the various types of tool grinders, and the so-called grinding stands for both tool and rough work.

Grinding stands are very simple, although they have some special features. Usually the motor is either built into the stand, with the grinding wheels attached directly to the armature shaft, one at either end, or it is mounted inside the base, and belted up to an arbor that carries the grinding wheels. Fig. 117 shows such a grinding stand with a driving motor mounted in the base. This mounting is advantageous in that it protects the motor from the dust and grit which flies from the wheel. This type of machine will require a shunt-wound d.c., or a squirrel-cage a.c. motor, with some form of simple automatic starting panel, controlled from a push button mounted on the front of the machine as shown. The controller should be mounted inside to protect it from dust. The machine should provide large, removable doors to give full access to the electrical equipment. This type of machine, when driven by a d.c. motor, sometimes has a small roller which is held against the wheel by a spring or other similar means. As the wheel wears down, the roller moves in toward the arbor, thus operating a rheostat and speeding up the motor. The rheostat should be so proportioned as to give a constant peripheral speed on the grinding wheel, regardless of its diameter. Cylindrical grinding machines are the most numerous. Most of these are driven by a constant-speed motor, with gear changes where it is desired to have an adjustment in grinding wheel speed. For direct current a shunt- or compound-wound motor with drip-proof covers and with a simple manual starter is all that is required. For alternating current a squirrel-cage motor with a manual resistor or compensator-type starter should be used.

One of the leading manufacturers of grinding machinery builds a machine with a constant-speed motor for driving the wheel and the traverse mechanisms and with an adjustable-speed d.c. motor for rotating the work. Where no direct current is available in the shop, a small d.c. generator, which may be seen in Fig. 118, mounted on the bed of the machine on the right, is driven from the main driving motor shown at the left. This furnishes the necessary direct current for the work-rotating motor. By using this combination, an almost unlimited range of speeds may be obtained by adjusting the voltage applied to the motor and by weakening the motor field.

This method allows the use of adjustable-speed motors, even in a shop where only a.c. power is available. Where direct current is available, the generator may, of course, be omitted. The work may then be revolved at the proper peripheral speed regardless of its diameter by adjustment of the motor speed by a small field rheostat. In Fig. 118, the method of running the leads to the motor on the movable headstock is particularly good. The wires are protected by a flexible metallic conduit, the slack of which is taken up by a spring-operated reel, with a special flared casting on the headstock to prevent sharp bends in the conduit. The a.c. driving motor

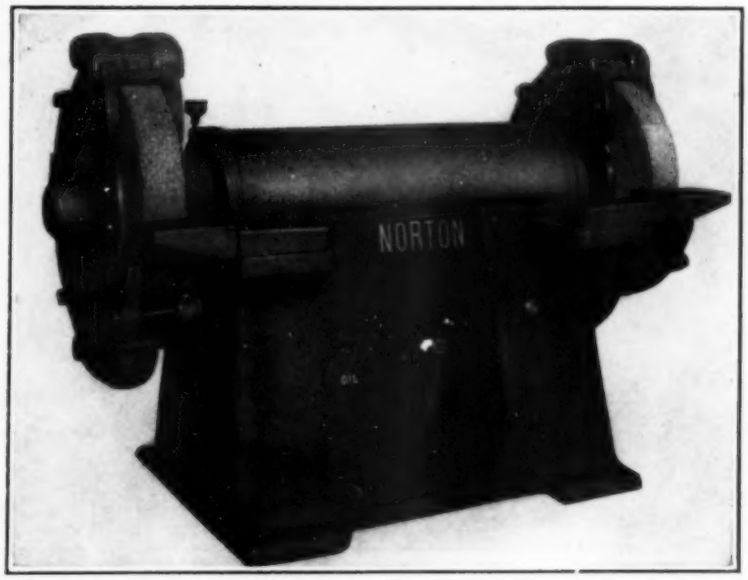
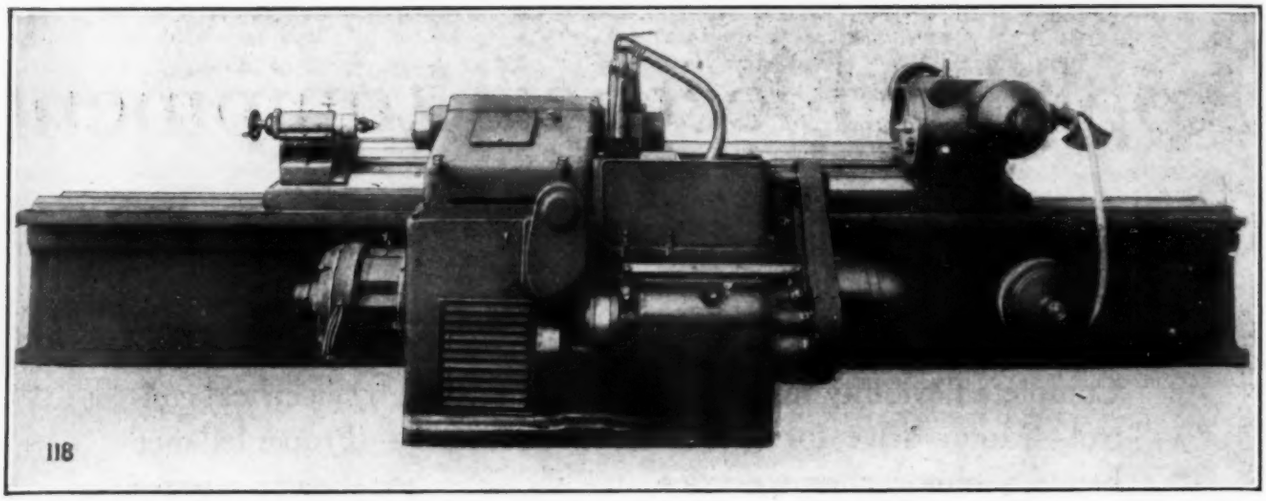
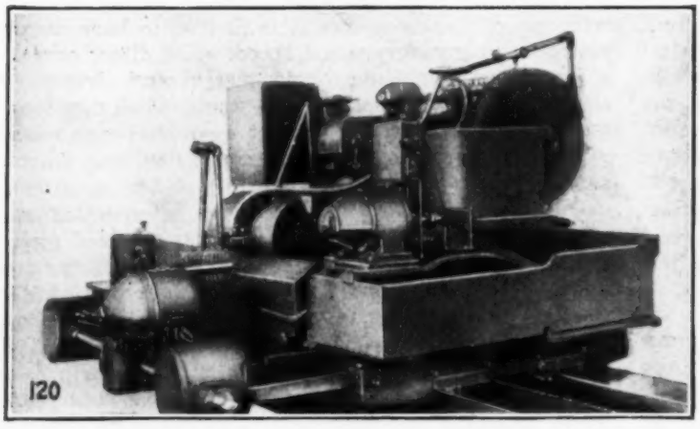
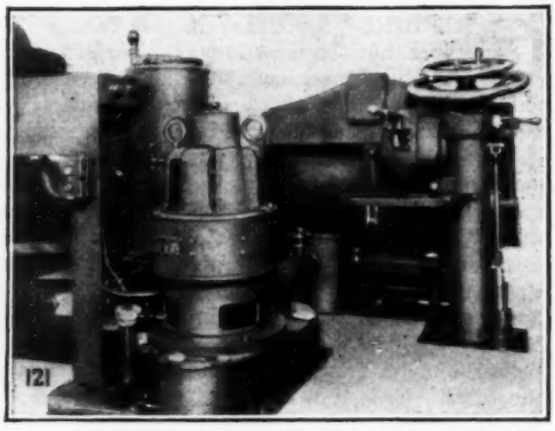


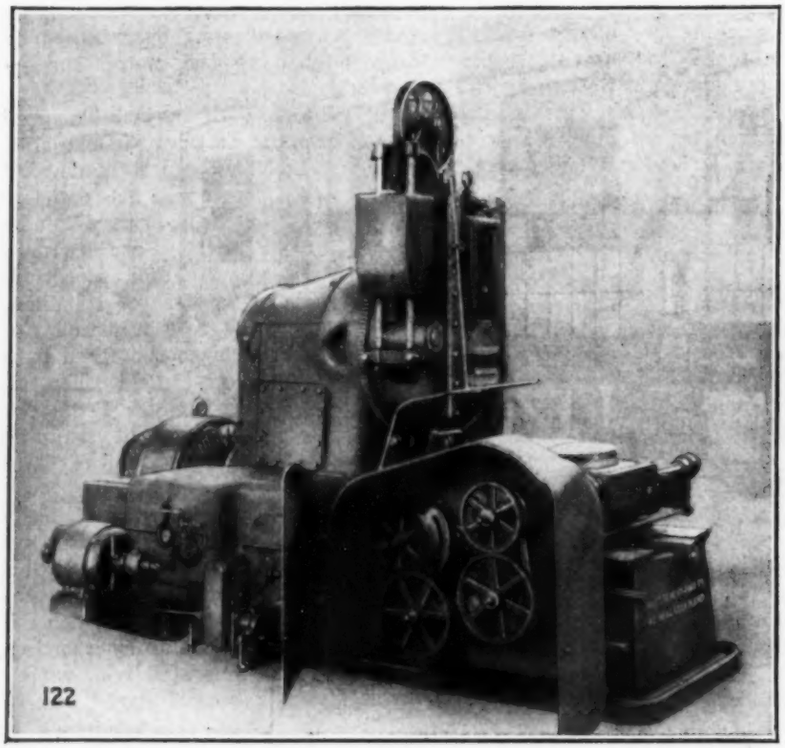
Fig. 117—Large tool grinder with self-contained motor drive

The fifteenth article. The application of electrical equipment to miscellaneous types of production equipment will be discussed later.









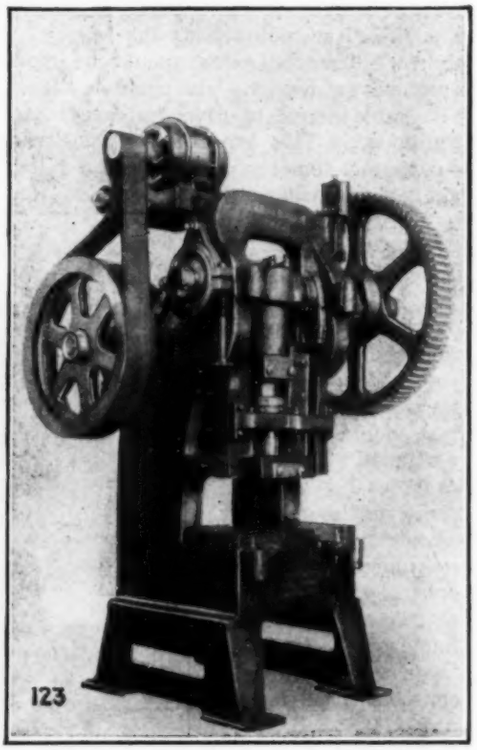


Fig. 118—Cylindrical grinder with d.c. generator for supplying power to wheelhead motor. Fig. 120—Grinding attachment on a 113-in. lathe. Fig. 121—Operator's position on the roll grinder shown in Fig. 119. Fig. 122—Planer-type gear cutter. Fig. 123—Motor-driven press with flywheel

should have a manual-resistor or compensator-type starter.

In the larger sizes, cylindrical grinders are quite elaborate pieces of mechanism, as may be seen in Fig. 119. They are used to an increasing extent for finishing large steel mill rolls. Used in this way they much resemble a lathe and, in fact, may be built as an attachment to a standard lathe. A driving head with live center and a tailstock with a dead center are required, as in a lathe, for supporting and rotating the work, and the electrical equipment used for this purpose is identical with that used on lathes. In addition there is a motor for driving the grinding wheel. It may also furnish the power for traversing the wheel along the work and should be an adjustable-speed motor with an automatic controller. Fig. 120 shows the wheel motor at the left just under the controller cabinet.

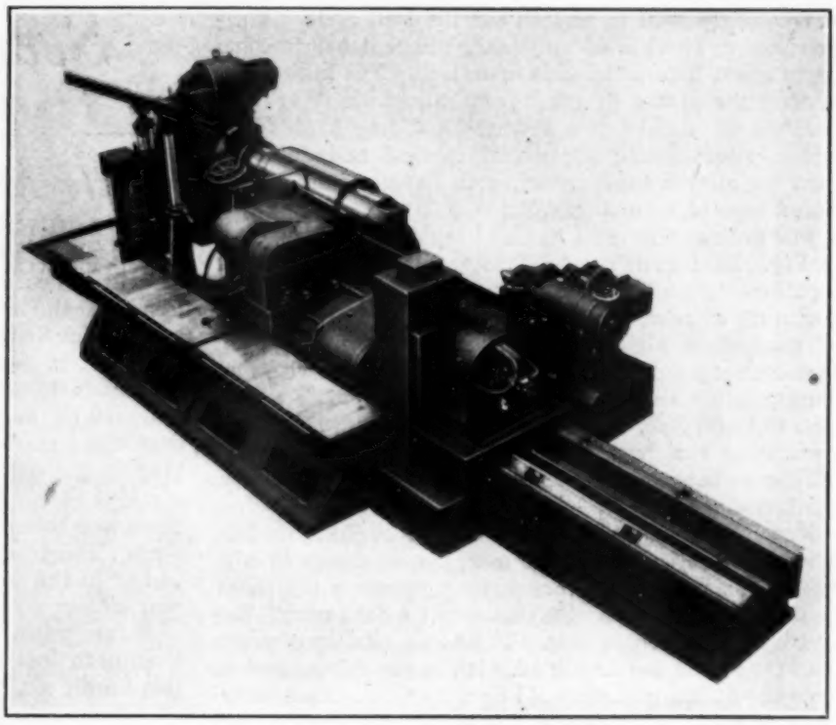


Fig. 119—Large roll grinding machine

The small motor at the top of the figure is a constant-speed, compound-wound d.c. motor having a small reversing drum controller that moves the wheel in and out. In the center of the cut is another constant-speed, compound-wound d.c. motor with a single non-reversing controller for driving the coolant pump. The motor at the back of the machine is also a constant-speed, compound-wound type with a reversing drum controller and is used to traverse the whole grinding machine, either along the bed, or to and from the work. As may be seen, all motors have drip proof covers to protect them from the water used on the wheel while grinding.

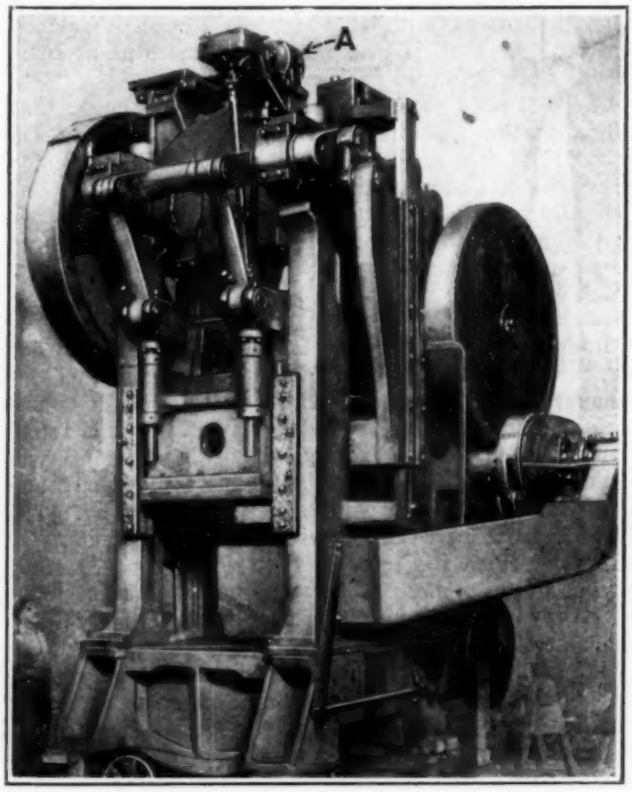


Fig. 124—Large toggle press equipped with die-lifting motor

In Fig. 121 is shown the operator's position of the machine shown in Fig. 119. This is a good example of the concentration of control possible when individual motors are used for the different operations. The drum controller shown is for the adjustable-speed headstock driving motor; the vertical constant-speed pump motor shown has an automatic starter (shown at the back of the post), which is started and stopped by the buttons at the side of the post, while the constant-speed wheel-drive and wheel-carriage motor is controlled by push buttons (shown at the front of the post), which operate an automatic controller not shown in this view.

Gear cutting machines are of many types. One type is simply a special form of milling machine, and consequently uses the same equipment as a knee-type miller. Others, of the hobbing type, are very similar. The shaper and planer type of machines may be driven by single constant-speed motors and hand controllers, or may have more elaborate equipment. One type, shown in Fig. 122, has been built for d.c. drive only and has adjustable-speed driving and indexing motors. The indexing motor usually runs at low speed, while the driving motor runs at the speed giving the desired cutting speed. After the reciprocating cutter has made a fixed number of strokes the motor is stopped and the indexing motor is speeded up to complete the cycle, thus bringing the gear again into position for cutting. After the indexing operation the indexing motor is slowed down, the driving motor started up, and another cycle started. Aside from the motors, a special, heavy-duty, plain, starting automatic contact is used, arranged so that an automatic limit switch, cam-operated, shuts off the motor at the proper time. Additional push buttons are used to start and stop the machine at will.

Punch and shear machinery are rather interesting. Because of the high momentary power required, and the comparatively long period of inactivity, a flywheel

is frequently used to smooth out the load cycle. However, the flywheel is of value only where it has to come up to speed before the next operation. For high-speed presses there is a limiting point at which it is good practice to discard the flywheel and use a standard motor, shunt-wound for direct current and squirrel-cage for alternating current, both having a single, inclosed type of manual starter.

For ordinary work, a flywheel is desirable, as shown in Fig. 123, together with a motor that will slow down considerably under load, thus giving the flywheel opportunity to release some of its energy. For this type of machine a high compound-wound d.c. motor or a high-resistance-rotor, squirrel-cage motor, with an appropriate manual starter, will allow as much as fifteen to twenty per cent slow down under full load, thus permitting the flywheel to restore to the machine the difference between its energy at full speed and that at the lower speed.

Punch presses and shears frequently have a belt drive between the motor and machine, as shown in Fig. 123. This belt is used primarily to cushion the shock on the motor caused by the punch hitting the work. The large press shown in Fig. 124 has an auxiliary motor at *A* for lifting the dies in addition to the driving motor. This die-lifting motor should be a high-resistance-rotor, squirrel-cage motor or a high-compound-wound d.c. motor. With either a single reversing drum switch with a spring to return the handle to neutral is satisfactory.

The balancing machine shown in Fig. 125 has an adjustable-speed d.c. driving motor with a reversing drum

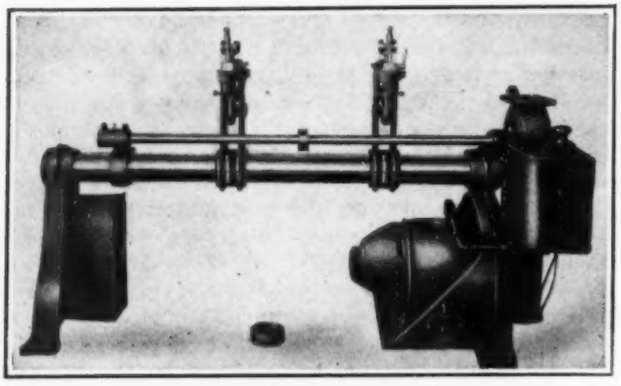


Fig. 125—Balancing machine driven by an adjustable-speed d.c. motor

controller for starting, stopping, reversing, and speed adjustment.

It has been possible to touch on a few of the more standard machines, and the more usual electrical equipment. A few unusual equipments have been described to show what is possible with a proper selection of motor and control equipment. It is believed, however, that the manufacturers of machinery as a whole have not taken full advantage of the possibilities held out to them by the motorization of their machines. In too many instances, the application of the electrical equipment shows it be just what it is—an ill-considered afterthought. But there is a growing and praiseworthy tendency towards the building in, wherever possible, of both motor and controller. Where this is not possible or practicable the electrical equipment should be arranged to appear an integral part of the design.

Seen and Heard

By John R. Godfrey

Idle Machines—Budgeting

MACHINES in storage earn no dividends. And when another department has need of the machines that are lying idle in a warehouse, the loss is all the more deplorable.

A recent visit to a government shop showed one department in sad need of machines to bore the crown brasses in locomotive driving boxes. The old machine assigned to the job may have been good in its day, but that was many moons ago. At present there is enough play in the spindle to effectively prevent its boring a straight hole. Furthermore, it is a temperamental machine and bores taper in either direction, just as it happens. The result is that the boxes may bear at either end or in the middle, and the man who fits them to the journal has a long job of scraping.

A few miles away is another government shop, belonging to another department. Out in the storage shed, thoroughly slushed against rust and apparently in good condition, is a boring machine that could handle the driving box job and many others. It has been stored in this warehouse for several years, together with several other machines that would be very useful in other departments.

It would probably cost less money to buy new machines for the shop in question than to try and get these machines transferred from the warehouse. It would take more red tape, ink and paper than can be well imagined. Not entirely because they are governmental departments, but because they are parts of a huge institution, with more or less sectional jealousy and the fear that, if they needed the machine at some future time, it would be hard to get.

There is need of some sort of a clearing house that will apportion machines and material where they are needed. It may need a man of great vision to decide where materials are needed the most in some cases. But it hardly requires unusual wisdom to say that machines in storage should be transferred to departments where they can be utilized every day.

* * * *

Budgeting, or allowing certain amounts of money for a given piece of work, is one of the modern methods of management. The latest wrinkle is to apply it to the tools and supplies used in a department. If it is found that ten 12-in. files and thirty $\frac{1}{8}$-in. drills per month will handle a certain job, just this number is dealt out, and they have to last or someone has to know why. The idea seems to be working out well in some plants. On the other hand it's possible that time may be lost by trying to nurse along some poor drills so as not to go over the budget. It might be a lot cheaper to buy a few drills at times.

It's a bit odd also, to find a shop that is very fussy on budgeting $\frac{1}{8}$-in. drills, keeping almost no record of small parts drawn for assembly. The screw machine department sends its products to a storeroom where they are added to the inventory—but they are drawn out without requisition of any kind. Assemblers just help themselves, and when the bins run low they order more.

Mechanical Features of the Trans-Atlantic Plane

Seven years of persistent mechanical effort are behind the light high-powered engine that made Lindbergh's epoch-making flight a possibility—Some of the features of engine, instruments, and plane

NOT discounting in any way the courage, intrepidity, and skill of the young aviator who guided the first airplane to make the long trip from New York to Paris, nevertheless the engineer and the mechanical man are inclined to think very much in terms of the mechanical achievement back of the flight. It is only a quarter of a century since the Wrights were making their first successful flights of only a few thousand yards, but the airplane engine, which is the heart of the flying machine, has now demonstrated its capacity not only for enduring continuously the strain of the more than 33 hours of high-speed running needed to cross the ocean, but even to be dependable for a much greater period of time.

According to the statement of Captain Lindberg, his motor saw 60 hours of service without any overhaul, and was still in perfect condition. The makers claim that this type of engine will give 1,500 hours of normal service with periodic overhauls after every 200 to 300 hours of running. It was the development of such engines, together with the invention of guiding instruments, and the introduction of new metal alloys, that make possible our present visions of the spanning of the two continents by commercial two-day flights.

The Wright "Whirlwind" motor, model J5C, as installed in the Lindbergh plane, is the result of seven years' intensive work on one type of engine without alteration in bore or stroke, and without changing any basic feature of the original design. Since February, 1920, seven successive models have been developed, and more than 1,000 engines sold. Most of these went into commercial service or in the United States Navy service where a great deal of technical experience was gathered that aided the development work.

Engine Details

At the close of the World War the entire American aircraft engine industry was concentrated on the production of water-cooled engines, and no American air-cooled engine of greater than 100 hp. had been successful. The early experiments of engine designers, however, led to the belief that higher powered air-cooled engines could be made successfully, and an experimental contract was awarded in 1920 by the United States Army for a 9-cylinder, 140-hp., air-cooled radial engine. Immediately afterward the Navy awarded a similar contract for a 220-hp. engine. This second engine, designed and constructed for the Navy, was the forerunner of the "Whirlwind" engine that carried the "Spirit of St. Louis" to Paris.

The Wright "Whirlwind" engine has a bore of 4½ in., a stroke of 5½ in., and is rated at 200 hp. at 1,800 r.p.m. The air-cooling system transfers the heat of combustion directly from the cylinder to the atmosphere.

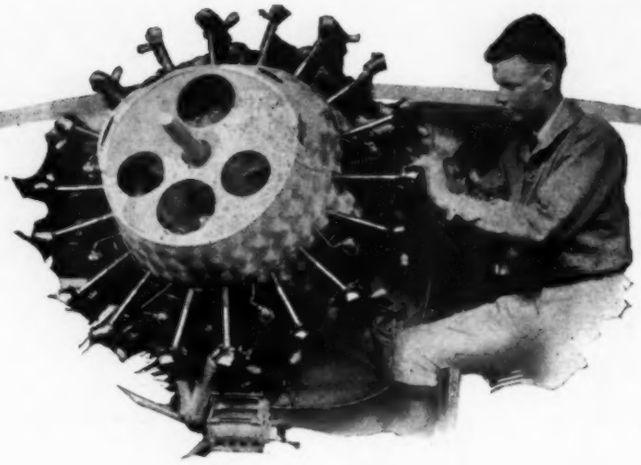
It is to the air mail service that great credit is due for the experience that helped so much to develop both the engine and the aviator who drove the plane. Records kept on a large number of "Whirlwind" engines show very long continuous flying periods, and an average period between overhauls of about 250 hours. Some of the engines have done more than 400 hours without major attention, and in 1,750,000 miles of recorded commercial flying during 1926 there were only three forced landings due to mechanical failures of the engines.

Fuel Consumption

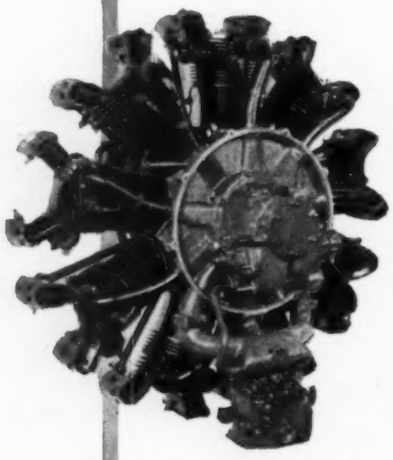
The "Whirlwind" type of engine of 200 hp. consumes from 9 to 12 gallons of gasoline per hour, and 2 quarts of oil per hour, although the engine used in the world's record endurance flight averaged only 7½ gallons of gasoline and a pint of oil an hour. The usual speed of the plane is calculated at 100 miles per hour.

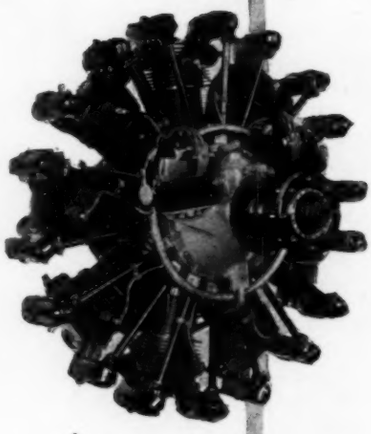
In the original engines with radial cylinders the cylinders revolved around a fixed crankshaft, the propeller being bolted to the crankcase. The present type of cylinder is of steel with an aluminum head, and the shaft revolves. The design of the shaft and connecting rods differs from automobile practice. One cylinder is hooked to a master connecting rod, and all of the other connecting rods are fastened to this one. As all of the moving parts of the engine create varying forces, one of the additional problems in airplane engine design that had to be met was in counterbalancing and stabilizing the engine.

Molybdenum steel ball bearings are used for the two crankshaft bearings. Integral steel cooling fins are machined out of the cylinder barrel forging, which permit direct heat transfer to the air. The combustion chamber is hemispherical in form, and the valves are set at an angle of 70 deg., with their heads flush in the combustion chamber. This design permits larger valves with increased lift, and more direct and larger intake and exhaust valves. It also gives increased area of fins around the valve ports and cylinder head. The construction of the cylinder and cylinder head is claimed to be responsible for the improved fuel economy in this type of engine. The valve gear is entirely inclosed to prevent the entrance of dust, or the blowing away of the lubricant from the bearing surfaces. It is claimed that with en-



Engine and Plane That Carried Lindbergh to Paris

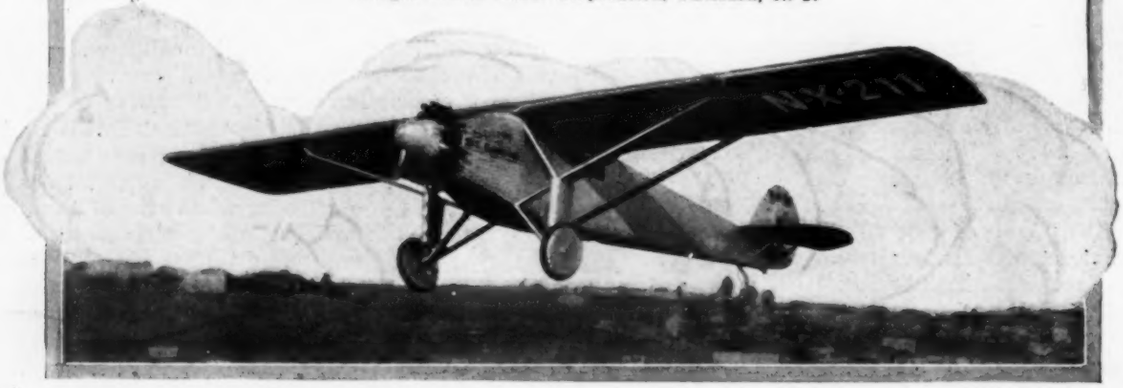


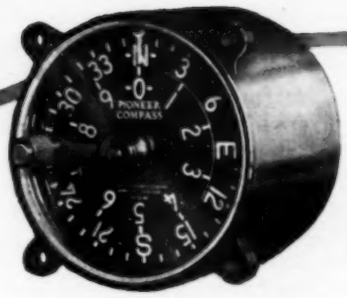


THE Wright "Whirlwind" engine is the outcome of seven years of design, test and practical operation. The operating results of few machines are ever watched and recorded with such minute faithfulness as the airplane engine, with the result that the designers incorporate improvements to offset any weaknesses.

BY estimate, the "Whirlwind" engine shown made 3,650,000 continuous revolutions of the propeller in order to carry the plane from New York to Paris. This engine is of the radial, nine-cylinder, air-cooled type, with 200-hp. rating, and developed on the trip 225 hp. with heavy load at an average speed of 109 miles per hour. The Ryan monoplane has a span of 46 ft., a chord of 7 ft. and weighed 5,130 lb. fully loaded at the start of the flight, or 2,415 lb. without gasoline.

Photographs by courtesy of the Wright Aeronautical Corporation, Paterson, N. J.





Earth-Inductor Compass Controller

Earth-Inductor Compass Indicator

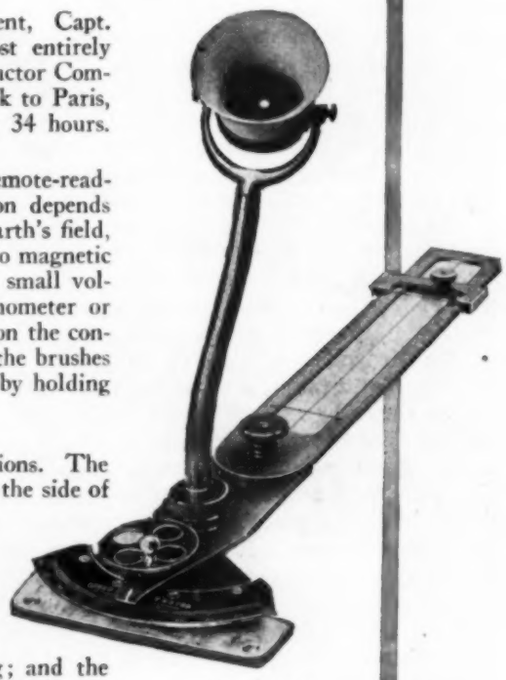
Instruments That Showed Lindbergh the Way to Paris

ACCORDING to his own statement, Capt. Charles Lindbergh depended almost entirely for direction upon the Pioneer Earth Inductor Compass in his non-stop flight from New York to Paris, begun May 20 and finished in less than 34 hours.

THE Earth Inductor Compass is a remote-reading direction indicator. Its operation depends upon electromagnetic reaction with the earth's field, and directions are indicated in reference to magnetic North. An air-driven generator gives a small voltage that is shown on a sensitive galvanometer or indicator. With the desired heading set on the controller (a mechanical device for rotating the brushes of the generator), the pilot steers simply by holding the pointer of the indicator on zero.

Earth-Inductor Compass Generator

OTHER instruments serve other functions. The Speed and Drift Meter, fastened to the side of the fuselage, enables the pilot to observe the angle of drift and to calculate the speed over ground or water. The instruments in the upper row of the board below show the motor r.p.m., the air speed of the plane in miles per hr.; whether the plane is turning or banking; and the altitude. At the extreme right is the Earth-Inductor Compass Controller, the Compass Indicator being at the lower center, in front of the pilot. Engine temperature and oil pressure are read from the instruments at the left of the Compass Indicator.



Speed and Drift Meter

Photographs by courtesy of the Pioneer Instrument Co., Brooklyn, N. Y.

closed valve gear the valve clearances do not require adjustment for as long a period as 50 hours, and that the lubrication of the rocker arm bearings is required only every 15 hours. With the exposed valve gear, adjustment and lubrication was necessary approximately every 5 hours.

The propeller of the Lindbergh plane is of forged Duralumin made by the Standard Steel Propeller Co., and is of the variable-pitch type. Each blade is a separate unit and is clamped into a steel hub. The engine is provided with dual magneto ignition, having Scintilla magnetos. The weight of the engine is 508 pounds.

The Guiding Instruments

The Lindbergh plane made the record non-stop flight of 3,610 miles, or 297 miles more than the aviators Carr and Gillman on their India flight. To accomplish this feat over a trackless ocean, and during the night hours, required instruments of great precision and of more rapid reading than those ordinarily used for position. The Earth Inductor Compass, which Captain Lindbergh said was his greatest aid in navigating, and which helped him to strike within a few miles of his theoretical point in Ireland, was the invention of Maurice Titterington of the Pioneer Instrument Co., of Brooklyn. N. Y. This compass consists of three major units, a generator, a controller, and an indicator, shown in the accompanying illustrations. The generator is in principle an electric generator with the earth as its induction field. It has an armature, a commutator, and a pair of brushes. The armature is supported on gimbals so that its position will be undisturbed by the rolling of the airplane. A windmill drives the armature and commutator through a universal joint.

The electric connections are made from the brushes of the generator and lead to the indicator, which is really a galvanometer. The position of the hand of the indicator shows the electrical potential being produced by the generator. The controller is a purely mechanical device. It is connected to the generator through a shaft so that rotation of the controller causes a corresponding rotation of the brushes of the generator. Dials upon the face of the controller show the angle through which the brushes have been oriented in relation to the airplane.

The operation of the compass depends upon the rotation of the armature, which cuts lines of flux of the earth's field and generates electricity. The potential, or output of the generator, depends upon the angular rotation between the brushes and the direction of the earth's field. This output is set at maximum when the brushes are in a north-south position, and minimum, or zero, when they are in an east-west position. The usual method of steering by this compass is to set the desired heading on the controller and then to steer to keep the indicator on zero.

Power for operating the generator is secured from the air stream through a windmill designed to operate at air speeds of from 70 to 130 miles per hr., and drives the generator at a normal speed of 2,200 r.p.m. The inductor compass, without the control shaft or casing, weighs about 13 lb., and is set in the rear of the fuselage, far enough back of the cockpit and wings to assure a smooth air flow, and far enough away from the cabin to be unaffected by varying magnetic conditions.

The speed and drift meter, fastened to the side of the fuselage, is another instrument of great importance, as it enables the pilot to observe the angle of drift, and to calculate the speed over ground or water. By sighting through the eyepiece, and bringing the cross-wire on a given point, he can note the drift from the graduations. Other instruments in the instrument board before the pilot show him the revolutions per minute, the air speed of the plane in miles per hour, the banking angle of the plane, and the altitude. The engine temperature and the oil pressure are also read directly from dials on the instrument board.

The Ryan monoplane, which carried Lindbergh to Paris, was designed by Donald Hall, of San Diego, Calif., and is a product of the Ryan Airlines, Inc., of San Diego. It was designed to operate up to a speed of 125 miles per hour, with economic speed under full load of 97 miles per hr. It actually developed a speed of 129 miles per hour in its performance tests.

The monoplane has a span of 46 ft., a chord of 7 ft., and a wing area of 319 sq.ft. With full load at the start of flight the wing loading is 16.1 lb. per sq.ft. The gasoline tanks have a total capacity of 425 gallons, and the gross weight of the plane under full load is 5,130 pounds.

The Lindbergh plane is completely enclosed so that the pilot must do his steering from indicators instead of the usual straightway vision obtained on most planes. In order to get a view in front of him he must look through a periscope, but by means of two small windows in the cockpit he can see on either side. For landing, the periscope can be pushed to the left to enable the operator to see enough of the horizon to enable him to land safely. Only one safety device, a small collapsible rubber boat, was carried. This boat was designed to occupy little space, and to assure a means of keeping afloat in case of a forced landing at sea. With extra gasoline tanks and special instrument board, the plane cost about $15,000. The plane carried no wireless or other signaling devices, and no sextant.

Protecting the Welder's Eyes

By C. B. Gordon-Sale

Shefford, England

IT IS a commonly known fact that continued exposure to the rays of the arc as used in electric welding causes injury to the eyes. The symptoms are readily recognized. They are smarting of the eyelids, tendency to tears, and the contraction of the pupils. Unless medical treatment be given within a few hours of exposure, complications may ensue causing partial or complete blindness.

Prevention being better than cure, a good supply of colored glasses should be at hand in every welding department. Unfortunately, some of the glasses furnished do not possess the requisite optical properties. The best protection is afforded by alternate layers of red and blue glass specially prepared for the filtration of light and not picked up at random. Always as many layers as possible should be employed. There are men who work with light glasses, saying that the darker ones hamper operation. To a certain extent this is true, but the eyes soon adjust themselves to new conditions, and handling may be done with glasses almost opaque to ordinary daylight. It should be insisted that dark glasses be used and worn constantly, and also that anyone suffering from eye troubles connected with welding should report immediately to the medical department.

Special Tools That Simplify Locomotive Maintenance Work

By Frank W. Curtis
Western Editor, American Machinist

Portable milling device for keyways—Milling crossheads, shoes and wedges—Grinding-in cylinder heads—Fixture for milling radial slots in links—Cutting by-pass grooves

SPECIAL tools, applied to locomotive maintenance work, have enabled the Missouri-Kansas-Texas Railroad Co., at its Waco, Texas shops, to simplify many operations that heretofore required complicated set-ups, and which consumed considerable time for completion. Among these tools is the portable milling device for cutting eccentric-crank keyslots in crankpins, illustrated in Fig. 1. After the correct location of the keyslot has been determined and laid out, the device is clamped to the crankpin as shown. It is driven by an air motor. Constructional details of the attachment are illustrated in Fig. 2. The cutter head, mounted on the base by a dovetailed slide, is operated by the ratchet lever *A*. The cutter spindle, driven through reduction gears by the drive shaft *B*, is adjusted to the depth of the cut desired by the threaded sleeve *C*, and is locked in position by the screw *D*. One cut only is required to complete the keyslot. With the exception of boring and drilling, crossheads are machined by milling. For machining the guide fits, the crosshead is mounted on a mandrel fitting in the hole for the piston rod, and is supported in V-blocks on the machine table. Four adjustable jacks level and support the work. The set-up is illustrated in Fig. 3. First, the upper face is milled, then the table is elevated to position the work for milling the lower face. One pass of the work in each direction completes the cut, after which the crosshead is indexed 180 deg. for the milling of the opposite side. Shoes and wedges are milled singly in a horizontal machine as illustrated in Fig. 4. The fixture has two locating and clamping blocks that grip the work from the ends. Inserted-tooth cutters, 9½ and 14 in. in diameter, respectively, finish both sides of the flanges and the inside face of the work in one pass. Front- and rear-cylinder heads are ground-in simultaneously by the device illustrated in Fig. 5, in which an air-motor drive is utilized. The driven bar *A*, supported by two straps, one at each end of the valve chamber, has attached on one end a crank to which is connected the rod *B*. On other end of the bar is an eccentric connected to the rod *C*. Both rods are connected to arms attached to the cylinder heads, so that rotary motion of the driven bar will transmit oscillating motion to the heads. The front head is supported by a roller stand that rests on the floor, while the rear head is supported by the counterbore into which it fits.

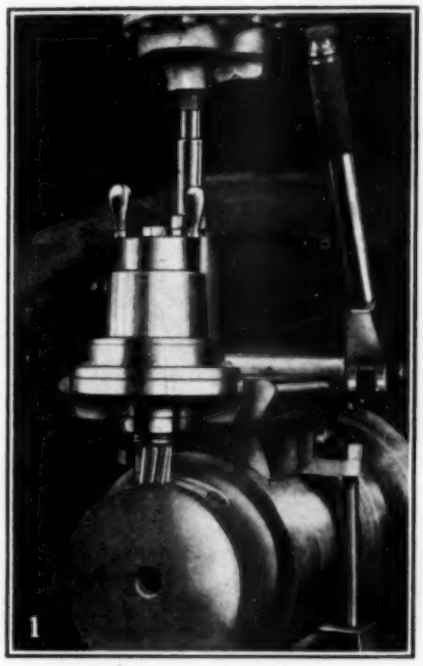


Fig. 1—Air-operated attachment for milling keyslots in crankpins

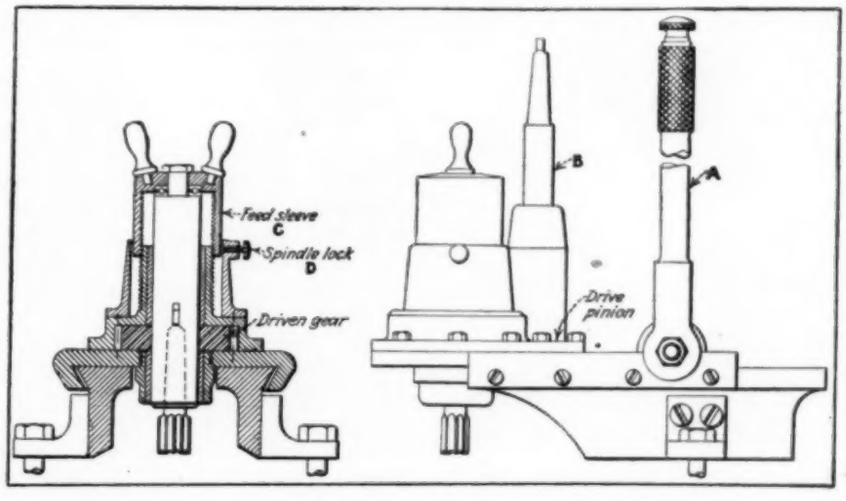
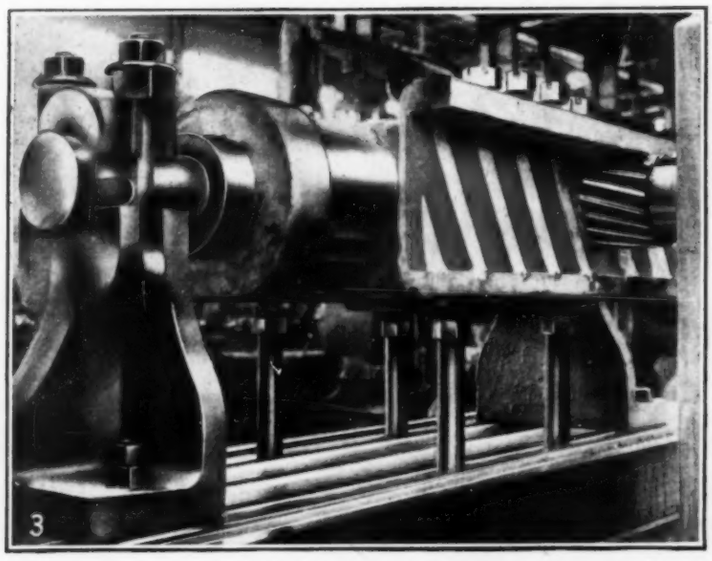


Fig. 2—Constructural details of the keyway milling attachment



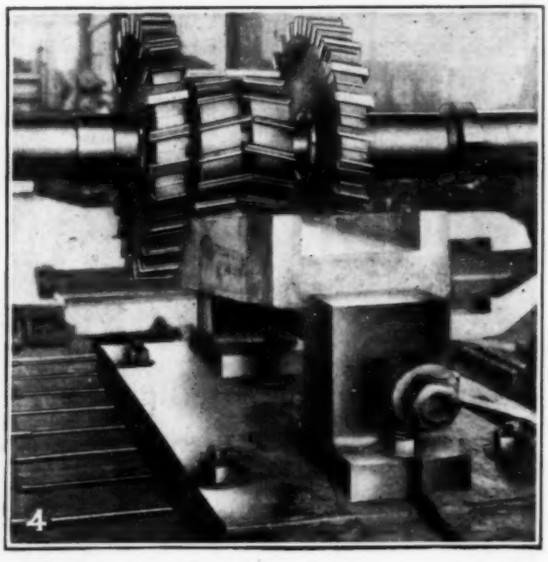
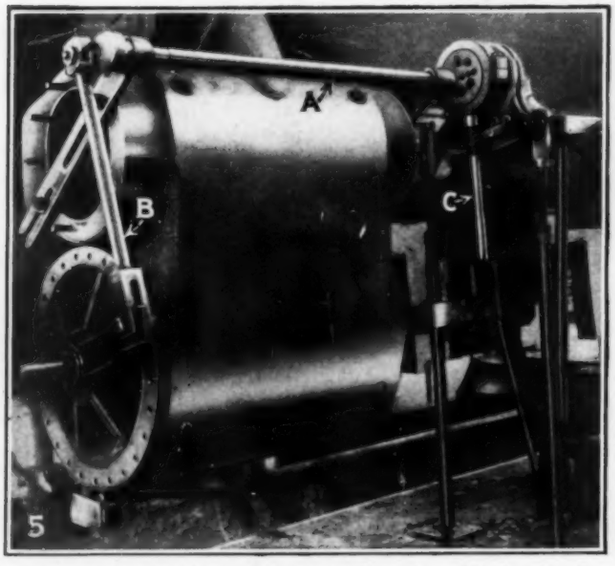


Fig. 3—Milling the guide faces of a crosshead. Fig. 4—Set-up for machining wedges



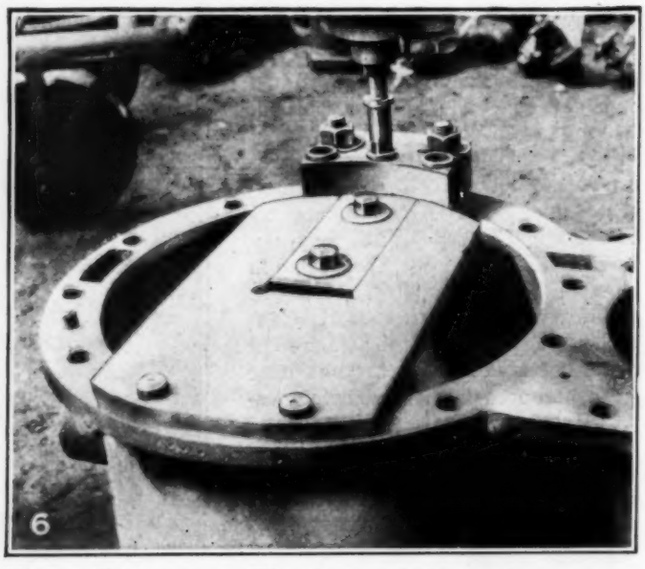


Fig. 5—Attachment for grinding-in cylinder heads. *Fig. 6—Fixture for milling by-pass holes in air pumps*

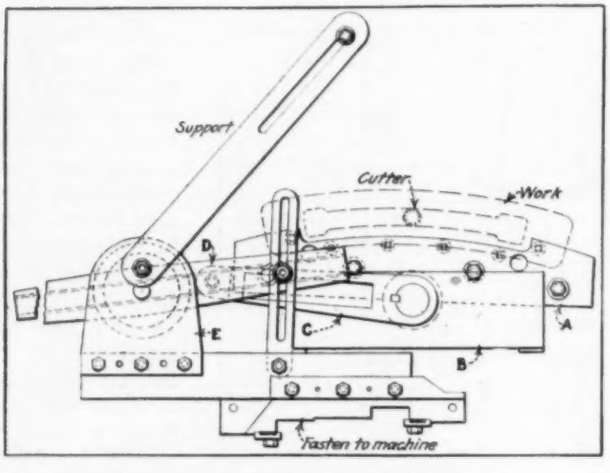


Fig. 7—Fixture for milling links. Adjustments for different radii are made by changing the angular position of the guide plate

By-pass grooves of the low-pressure steam end of cross-compound air pumps, are milled by the portable air-operated attachment illustrated in Fig. 6. It comprises a plate, fitting over the end of the cylinder. The opposite end, a sliding member, is attached to the cylinder. It has elongated slots, and is connected to the plate, so that it can be set to suit the diameter of the cylinder bore. Graduations enable a quick setting to be made for pumps that have been rebored. Links have radial slots milled by means of the fixture illustrated in Fig. 7. The link is located in the work holder *A*. The holder is pivoted to the fixture base *B* by a 4-in. diameter pin, so that it can swing in either direction. The pin, keyed to the work holder, has the arm *C* connected to it. On the outer end of the arm is a shoe fitting into a T-slot in the guide plate *D*. The guide plate is attached to the the bracket *E*, on the machine knee, and remains stationary while the fixture travels. The movement causes the shoe to travel in the angular slot of the guide plate, which in turn causes the work holder to swivel as it feeds past the cutter, thus cutting a radial slot.

Automotive Production

Crankcase Fixtures and Methods

By FRED H. COLVIN
Editor, American Machinist

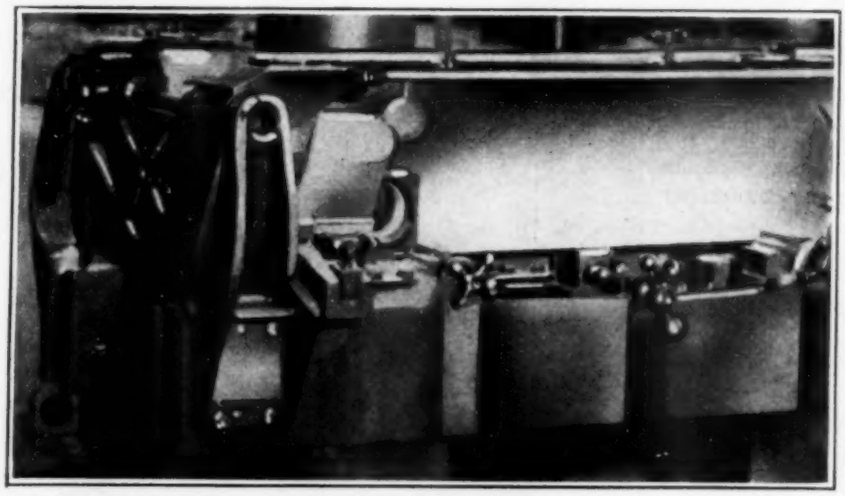


Fig. 1—Drilling four locating holes

TRADITIONAL methods of machining crankcases went into the discard in the new line-up for the Series "80" Pierce-Arrow in the Buffalo plant. Instead of starting with the milling of the main surfaces, four holes are drilled and faced in the special fixture, Fig. 1. This fixture is of unusual design as can be seen in Fig. 2. It is really a casting inspection device as well as a fixture for locating the bushings for the four holes to be drilled in the first operation. The jaws *A*, operated by the ball handle *B*, Fig. 2, center the casting endwise by the center bearing support, while handles *C* and *D* operate leveling buttons that take care of slight inequalities and support the casting, which is held in place by clamps *E*. Then arms *H* and *I* swing over the work and are locked in position by rods that fit into supports *K* and *L*, while *M* is a locating target for insuring that the cross-hole comes in the right place. Another locating target is at *O*. When the casting is properly located and clamped in position, the four holes are drilled and faced, the supports at each end being at a different height. The drilling is, however, quickly performed and all future operations are located from these four holes, which give an unusually good support and insure accuracy. Following this, and utilizing these holes and surfaces, the crankcase is turned over on the fixture in Fig. 3 and the clearance holes for the connecting rods are bored. The end holes have pilots as at *A* and *B*, the boring head being hollow and going over the pilots. The crankcase is moved along by means of the crank *C* and is indexed at suitable locations for each of the six bores.

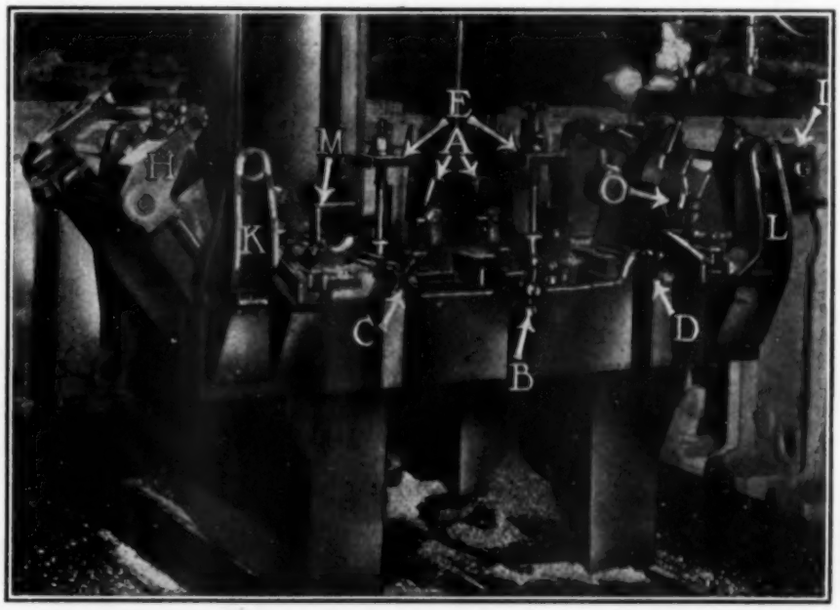
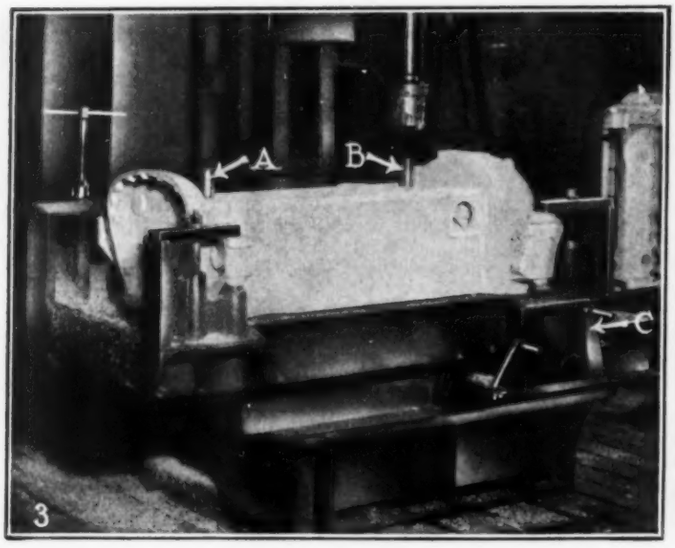


Fig. 2—Fixture for drilling the four locating holes. It also has a target to show the location of the cross-hole

Automotive Production



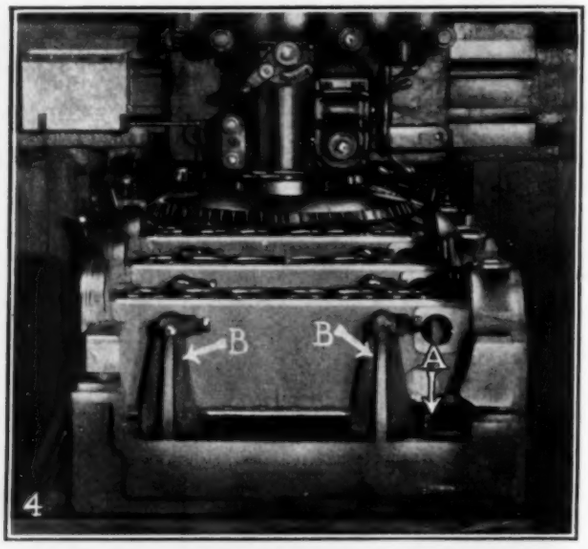
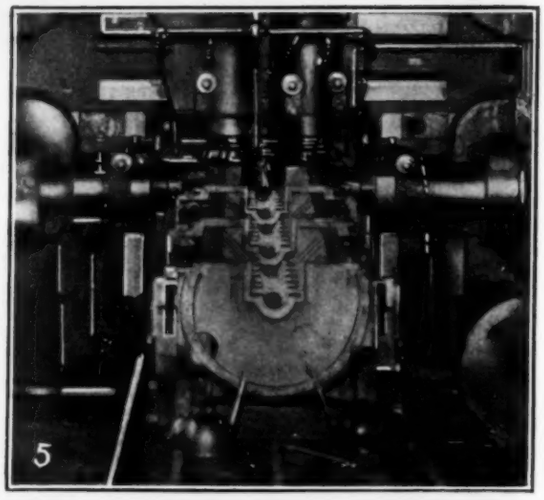


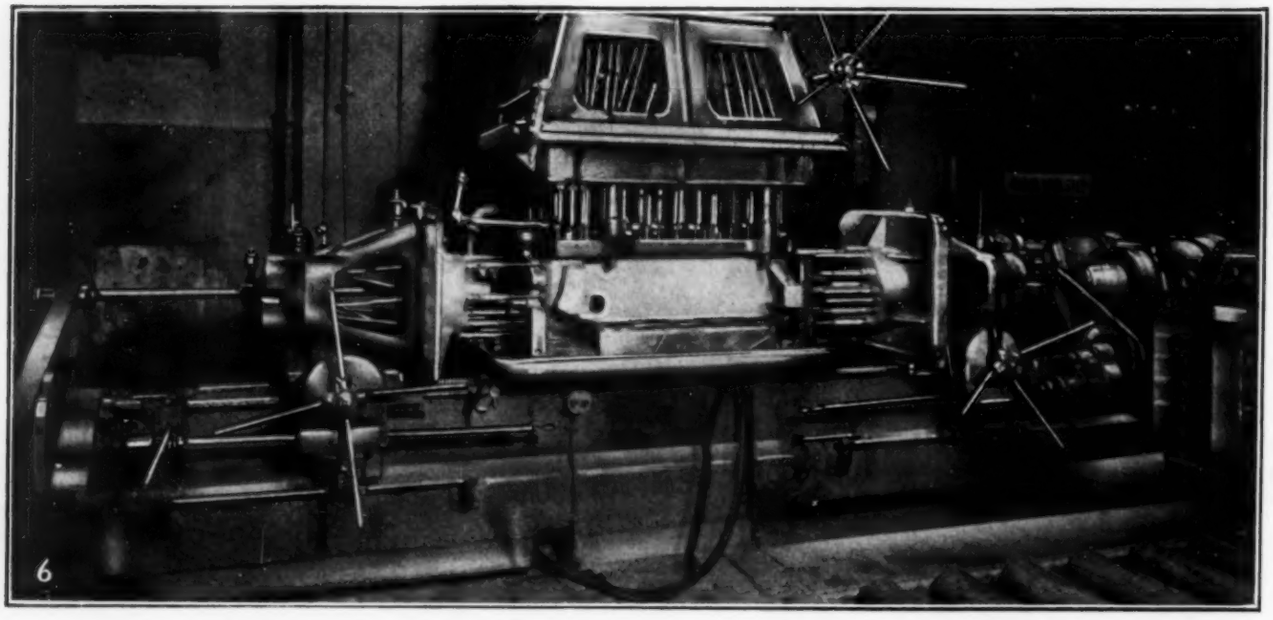
Fig. 3—After the drilling operation, the crankcase is turned on to the fixture shown and the clearance holes for the connecting rods are bored

Fig. 4—The surfaces for the cylinder blocks are milled at one pass by a large cutter. Struts support the crankcases against the thrust of the cut

Fig. 5—In this view can be seen the milling of the oil-pan joints, the bearing-cap seats and the ends of the support arms

Fig. 6—In drilling the top and both ends of the crankcase, ninety-four drills are in operation at the same time, in a three-way, multi-spindle machine





Automotive Production

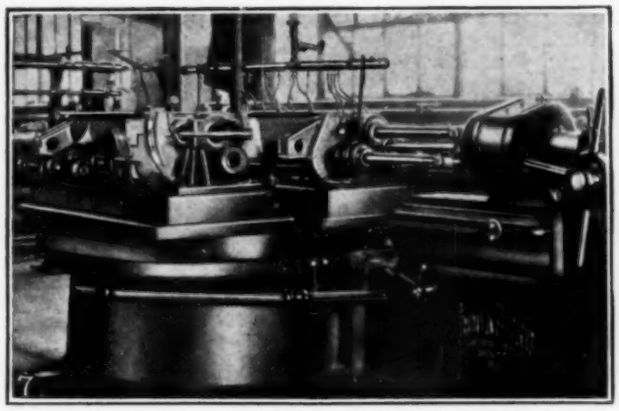


Fig. 7—Boring the crankcase.

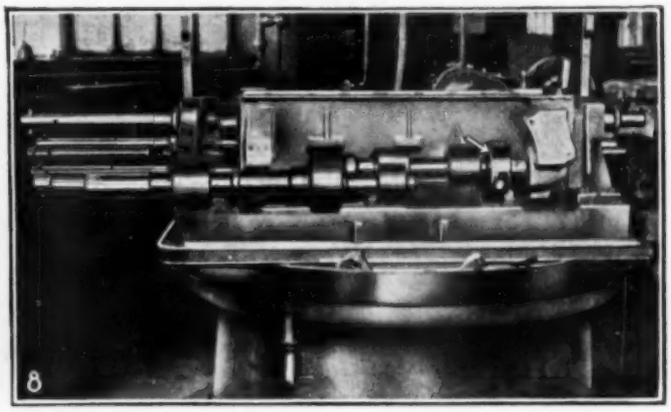


Fig. 8—Close view of fixture and bars

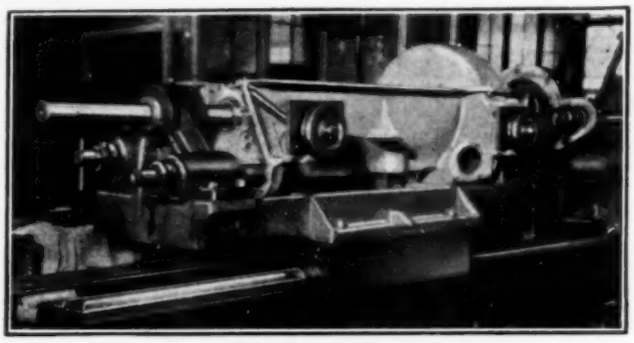


Fig. 9—The final boring

Again located by the four holes, the surfaces for the cylinder blocks are milled at one pass by a 31-in. cutter, as in Fig. 4. This view shows how the fixture locates the cases, how it clamps the flanges at *A* and also how the upper parts are supported against the thrust of the milling cutter by the arms *B*.

Reversing the crankcases and bedding them on the surfaces just milled, although still locating them by the four holes, the other sides are milled as in Fig. 5. Five cutters are seen milling the oil pan joints, the bearing cap seats and the ends of the support arms. There are eight cutters in all though three of them cannot be seen in the picture. Conveyors on each side of these machines facilitate handling the cases between machines.

Single Drilling Operation

Drilling the top and both ends of the crankcase is done in a single operation, Fig. 6, using a Baush machine having 94 spindles. The bottom holes are drilled at a succeeding operation. Rough boring the crank- and camshaft holes is done at one operation, and the finishing cut is also done on the same machine, a Rockford, Fig. 7. Two fixtures are mounted on the rotary table, each fitted with its boring bars, and the crankcases are first rough- and then finished-bored. The indexing table permits one case to be unloaded, a new one put in place and the bars inserted, while the other case is being bored. A close view of the bars is seen in Fig. 8, one carrying a head at *A* for facing for the starting motor.

The final boring is done on a special fixture mounted on an engine lathe having a raised head, Fig. 9. The fixture is mounted on the carriage, the finish bars being part of the outfit. This operation is to remove any distortion that may have been left after the preceding borings. It will be noted that the wheels used in assembly have been bolted on the case ready for its going to the tracks in the assembly line.

Aircraft Mileage in 1926

MORE than 23,000,000 miles were flown by civil and commercial aircraft in the United States during 1926, according to William P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics. In addition to this mileage of heavier-than-air craft, it is estimated that a total of 37,500 miles were flown by lighter-than-air craft during the year.

Reports from scheduled air transport operators and operators engaged in sightseeing, exhibition, advertising, photography, crop dusting and other branches of aerial work indicate that approximately 23,310,355 miles were traveled by flight of 1,536 planes during the past year, using an average speed of 80 miles per hour as a basis of comparison. If the Army, Navy and Coast Guard flying time were to be added to this figure the total American air mileage for heavier-than-air craft would be 48,586,492 miles, he said.

Flying over eighteen regular airways, 194 planes maintained a scheduled mileage of 4,474,772 miles in 1926. Reports from all air operators indicate that 94,353 passengers were carried on planes free of charge during the year. The number of paying passengers transported totaled 676,567. The total number of hours flown reported was 234,313 and pay freight carried amounted to 418,986 pounds.

Reports to the Department of Commerce indicate that 4,466 students were given training in aviation in 1926 outside of the army and navy.

The average cost of operating an automobile is 10.27 cents per mile according to figures computed by the Iowa State College. Eleven automobiles, ranging in price from $400 to $1,800 were used in determining the cost. The averages are: gasoline 1.61 cents, oil 0.31 cent, tires 0.98 cent, service 1.24 cents, depreciation 3.16 cents, interest 1.24 cents, insurance 0.31 cent, garage 0.83 cent, and license 0.59 cent.

THE · FOREMAN'S · ROUND · TABLE

Should the Foreman Get a Bonus?

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"HEARD a new one the other day, Ed. There's one big shop where the men don't punch a time clock, but the foremen do."

"Well I'll be darned, Al, what's the big idea?"

"Not so bad as it sounds, Ed. The super says it's production he wants—not hours in the shop. Because a man rings-in on time is no sign he's producing. But if the foreman is on the job the men begin to work when the power goes on.

"But that isn't all, Ed. It's only part of the story. The foremen get a bonus that depends on the work their men get past the inspector. They figure it's more important to have the foreman on time because he'll get work going promptly."

"Don't some of the high-brow managers say that foremen ought to be above a bonus? That they ought to be men big enough to give their best without any reward, Al?"

"Yes, Ed, I've heard that sort of thing too. And it's generally from shops that pay a foreman mighty little at that. I can't see why the foreman doesn't earn a bonus, if he boosts production, as much as anyone else. None of us get any too much pay anyhow."

"Do the men get a bonus too, Al?"

"Sure thing, Ed. And if there's anything slow about materials, or wrong about tools, they're stepping on the foreman's tail till he fixes it."

"Don't know as I'd like to be prodded by the men, Al. What's the use in being a foreman if you can't be boss?"

"If you're on your job they won't have any prodding to do, Ed. And then again you can soothe your ruffled feathers by knowing they're prodding you into a bigger bonus. It's your job to help them earn more money. The more they make the bigger your bonus, and the more production for the firm. I think it's a great scheme."

Were Ed's objections to the plan well founded?
Was Al right in boosting the bonus plan?
How about the time clock for foremen?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Will Standard T-Slots Help Production?

SOME years ago I undertook to standardize details on the machine tools in a shop having a great variety of makes, and found that the expense involved was more than doubly offset by the increased efficiency.

The T-slots in planers, shapers, and milling machines were standardized by conforming them to a dimension that would permit the use of a standard bolt and a standard key for vises, jigs, and fixtures on all machines. Under the old system, clamping bolts were always scarce, and often a man would waste time grinding a bolt head to fit the slots of the machine. This practice was common, and in a short time the bolts were spoiled for use on other machines. In some instances the men would hide bolts to use on their own work, and it was impossible to keep a supply of bolts on hand. Time was lost by the men having to look for bolts every time a new job was to be set up. After standardizing the T-slots this condition was eliminated. Another detail included in my standardizing program was the threaded nose on lathe spindles, thus making all chucks and face plates interchangeable. This reduced the number of chucks and face plates required. The purchase of new chucks had been contemplated, and the standardizing was paid for out of the saving.

We then went to holes in lathe, drill press, and milling machine spindles. In the twelve lathes we found four different tapers. These were reduced to one standard size. This shop, like most others, was obliged to carry a great variety of styles and sizes of taper shanks, lathe centers, reducing sockets, and other accessories. About 80 per cent of these sizes were either discarded or revamped. From my experience in this work I venture to say that any manager can increase the efficiency of his shop by adopting an intelligent plan of standardization. —H. L. WHEELER.

IF THE practical man has anything to say regarding the purchase of a new machine it will usually have standard T-slots, machine screws, etc. When a new machine is purchased, and the foreman is not familiar with all the parts therein, the first time it goes down for repairs he is almost certain to find out if all the parts are standard. It is one of the vital things, for it means just what parts will have to be carried in stock for repairs. In the case of a manufacturer who markets a new tool without a rival, he may find it temporarily profitable to make parts that have to be purchased from him on account of not being standard, but this necessitates delays, and when a rival machine appears with standard parts he will lose out.

In the case of T-slots, if a fixture can be used on a number of milling machines it makes each machine upon which it can be used that much more universal. Standard tapers for spindles, standard centers, shafts, pulleys, grease cups, gears, and the most common of all parts, keys and screws, are desirable. —M. W. TAYLOR.

Hiring Back the Fired Workman

HIRING back the discharged workman was a very good proposition. In the first place, Grogan was not let out on account of his workmanship but for disciplinary reasons. The period he was away did more good than anything could. This gave him a certain amount of schooling that would be of benefit to him in his old position, besides broadening out his mind. There are a great many Grogans in the world, and letting them out is the best lesson that can be given to them. When circumstances change, and they desire to come back to the old shop, it is like putting new blood in old veins. His former fellow workmen will take notice and profit by Grogan's experience. This brings to mind a shop that had the name of turning out A1 mechanics from its apprentice boys. In this factory, the management seemed to have the idea that when a boy completed his time, he should seek other employment for a time, and then come back. To carry out this policy, this shop never paid the boys the prevailing rate, but offered them a lower wage than to other men doing the same class of work. This discouraged the newly-made mechanics. They soon found out by leaving the home shop that they could command top wages in other factories. After drifting about, some returned and found a welcome, and the rate of pay paid to the regular workmen. This method made better workmen with broader experience than had they stuck to the old shop. It seems a wise course to follow Al's footsteps in like cases.

—WM. W. BARNETSON, *Supt., Canada.*

THERE are men who so detract from the efficiency of an organization that it is well that once out they should be always out. They are of that small minority who are born trouble makers, and never will fit in anywhere. But often a man is fired due to reduced orders, being selected because he is, perhaps, one of the least efficient group, but who, nevertheless, is good enough to warrant being taken back when business booms again in that shop.

Very often a younger man, who is discharged because he has not the necessary skill or experience, may profitably be taken back later if in the meantime he has been gathering the necessary experience. Younger men, who

THE · NEXT · TOPIC

Applying the Budget to Small Tools

QUESTIONS

What is accomplished by limiting the tools allowed for a job?

Does this tend to limit production?

Or does it induce greater care of tools?

were a bit wild and hard to control, often settle down, and if the record for their intervening employment is clean, little chance is taken if they are rehired. In fact, the whole thing boils down pretty much to an individual problem. —EDWARD J. GORMAN.

IN THE case under question, there is no reason why the man should not again be hired, inasmuch as he has learned his lesson. The man who makes his way back after having been discharged, appreciates that he now must deserve his niche, and not unlikely, if he has been a worthy employee in other ways, he will strive all the harder to make up for past transgressions. Whether he has been a toolmaker or other worker, the machine shop foreman has a certain line on this man's abilities, and need not break him in anew. Thus the foreman is freed of at least this one worry and responsibility. After all, that is the foreman's prime concern; he must procure individuals who can fit into his plant's peculiar positions. —FRANK V. FAULHABER.

I CAN'T see that there was anything soft-hearted about rehiring a discharged workman, when Al was in full possession of the facts. To have merely rehired a man because he was sorry for him, without any facts that would indicate the overcoming of his faults, would certainly have been soft-hearted, but under the circumstances described, Al merely showed good judgment. Practical ethics and sentiment have a distinct place in the shop. The more precise and exacting the work is, the greater the need for obtaining a man's mental as well as physical co-operation. Ethics and sentiment based on the square deal form the cornerstone of any good shop organization. —W. F. MICHAEL.

Arguing With the Big Boss

AL WAS right in opposing the boss in this instance, as in many cases the big boss gets away out of line in his ideas about set-ups on different jobs. A foreman should follow the method which he is confident is the most practical, along with a little common sense and judgment. As for a foreman laying out work ahead, he should use the machine best adapted to the work regardless of the machine bought for the purpose. The foreman is not always responsible for idle machines in the shop, as the fault may be with the man higher up.

—WM. K. RUSHING, JR.

Getting Information from Salesmen

THE good traveling salesman is a master of the art of dealing with men. He is a great inspirational power. He constantly meets a great variety of individuals, learns a considerable range of point of view, acquires a wide knowledge of industrial practice, and by his courtesy and consideration is a spreader of good fellowship.

Such a man is a tonic to those whom he visits. There is about him the fresh vigor of the open air and of the freedom from routine. The traveling salesman goes about from place to place soliciting orders like the bee gathering honey. The bee, in his visits to the flowers, conveys accidentally the fertilizing pollen by which they are propagated. So can the traveling salesman by the conveyance of fresh points of view, new suggestions, and an alert, vigorous personality, impregnate minds to the conception of new ideas and better methods. My experience is that the machine salesman will generally go out of his way to be helpful, even where there is no immediate prospect of return for his helpfulness.

—J. J. WOFFINGTON.

Getting New Blood in the Shop

TAKING on an entirely new line of products, highly specialized in their design, is the only circumstance that I believe would make it advisable to hire foremen from the outside. In that case, it would probably be desirable to obtain a foreman who has had experience with the products. New blood is a valuable asset, and it should be supplied from time to time; but it can be supplied in the ranks, rather than by bringing it in over the older employees. An organization that makes a practice of bringing in its foremen from the outside cannot hope to develop loyalty among its workers. Those workers who are ambitious soon analyze the situation, and step out when the opportunity affords, even though they like the particular firm and its type of work sufficiently to hope they may some day come back to it after they have established themselves as foremen elsewhere.

—JAMES P. KEATING.

THE reason given by Al for hiring an outside foreman would be justified in a small factory where the selection would be limited to a small number of men, but in a large organization there would be more opportunity of selecting an eligible man. It would not, however, be policy to try a man in the shop unless he was considered capable, because if he failed to make good, no doubt he would leave the employ of the company, and a man who was a good mechanic, but not suitable as a foreman, would be a loss to the firm.

A new foreman can best get co-operation by first getting the confidence of the men, and after accomplishing this, gradually bring about any changes he may deem advisable. In this way he will not receive the antagonism he would if he started immediately to reorganize the methods to which the department is accustomed and with which the men are familiar.

—H. J. MALONEY, *Foreman.*

Paying the All-Around Man

IF YOU are so fortunate as to have your machine shop in a community that is full of all-round men, you are extremely lucky, and probably accept your good fortune as a natural heritage, and would not think of paying extra money to these men. But if you find yourself like the majority of us, you'd be glad to pay him just a bit more to show your appreciation, and to dispel all thoughts of shifting jobs from his mind, because he would save you money and worry in spite of the increased wage. Of course, in paying extra for this ability, you impose on yourself the necessity of using it intelligently, and not wasting it on mere routine work. And incidentally, you can give yourself no better incentive to use the ability properly than by the fact that you are paying actual extra cash each week for it.

—EDWARD R. MILLER, JR.

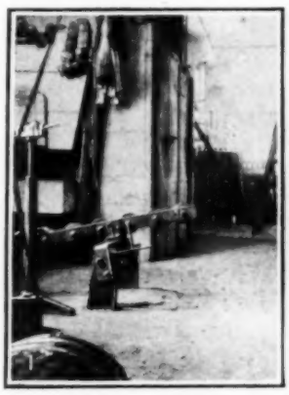
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Binding Railway Armatures

BY FRANK C. HUDSON

One of the convenient devices in the shops of the Havana United Electric Railways is the foot control of a clutch in the headstock of the lathe used for putting the binding wire on the armatures of the motors. The saddle, cross-slide and feed-rod have been removed, as it is only necessary to use the lathe for swinging the armature. A clutch has been installed in the headstock,



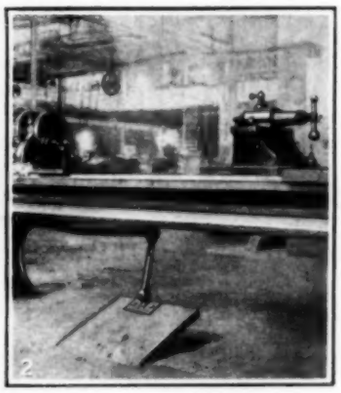


Fig. 1—Tension device. Fig. 2—Lathe for binding armatures

this clutch being controlled by the large treadle under the lathe bed. By this means the operator can throw the clutch in and out from almost any position in front of the lathe, and so have both hands free to control the binding wire.

At the left is shown the wire straightening rollers, and there is also a friction device so as to secure the proper tension on the wire as it is being wound.

Fixture to Hold Taper Shank Reamers —Discussion

BY JAMES MCINTOSH

The device shown by Herbert M. Darling on page 505, Vol. 66, of the *American Machinist*, to hold taper shanked reamers for milling the tangs, calls to my mind the days when standard, plain milling machines were the only machines available for that class of work.

There are now on the market several milling machines with rotating tables and vertical spindles on which work of this kind may be done much more economically. In the case of a reamer-shank job, the reamers would be held in a ring holder fitted to rotary table in such manner that the inner ends of the shanks would be exposed to double cutters on the vertical arbor, and because of their radial position they could be spaced very closely.

Thus there would be no cutting of air, nor would there be any time lost in handling the work from one cutting position to another. There would be continuous performance of useful work, and with the cutters flooded with oil or cutting compound, the maximum limit of cutting speeds and feeds could be attained.

With this method, the available time for loading and unloading is the period required by the table to make one complete rotation, less a safe distance away from the pieces in the cutting area. A group of machines can be handled by one operator, whereas with the method cited by Mr. Darling only one machine could be taken care of properly.

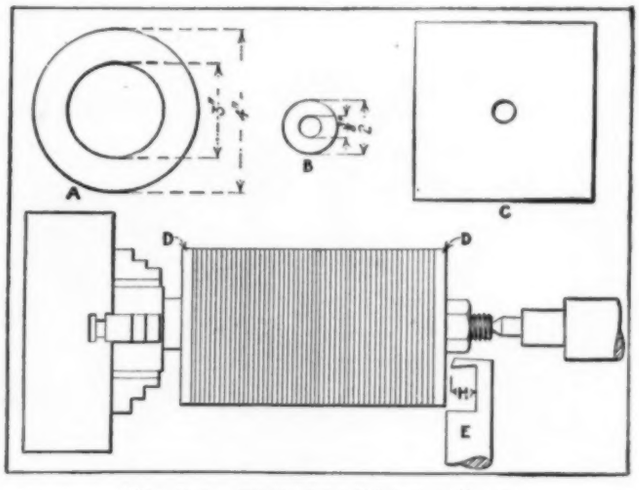
The clamping ring can be supported by a series of springs at the clamping bolts, and the holding pressure need not be great, since the pressure of the cut is sidewise.

Making Washers

BY CHARLES KUGLER

Recently I had the job of making 200 washers, $\frac{1}{32}$ in. thick, from stamping steel. One hundred were to be 4 in. in diameter with a 3-in. hole, as shown at *A*, and one hundred were to be 2 in. in diameter with a $\frac{3}{4}$-in. hole, as shown at *B*, in the sketch. I made the 200 washers out of 100 pieces of steel $4\frac{1}{4}$ in. square, in what I believe to be a novel way.

I first drilled a $\frac{3}{4}$-in. hole in the centers of the 100



Novel method of making washers

pieces of steel, *C*, and ganged them on an arbor, using two cast steel washers, *D*, to hold them rigidly. I turned them to a diameter of 4 in., then with the tool *E* I bored, or trepanned, the hole in the larger washers. Once the tool *E* was set correctly, it did not need to be disturbed. When the washers filled the space *H*, the tool was run back and the washers removed. This operation was repeated until the large washers were finished. Then it was necessary only to turn the small washers to an outside diameter of 2 in., and the job was completed.

Making Tools by Arc Welding

BY ARTHUR A. MERRY

A very material saving has been effected in the cost of tools made in our toolroom since we started to build them of steel sections welded together. The welding machine was purchased primarily for use in the manufacturing department, but its possibilities in the way of economical construction were soon recognized throughout the entire plant, particularly in the toolroom.

The illustration herewith shows some of the tools that have been built up from steel parts by the welding process. Not only is the time of the patternmaker saved but there is no delay because of waiting for castings from the foundry. Instead of paying eight or ten cents per pound for castings, we use steel at three or four cents, to say nothing of steel from the scrap pile at no calculable cost.

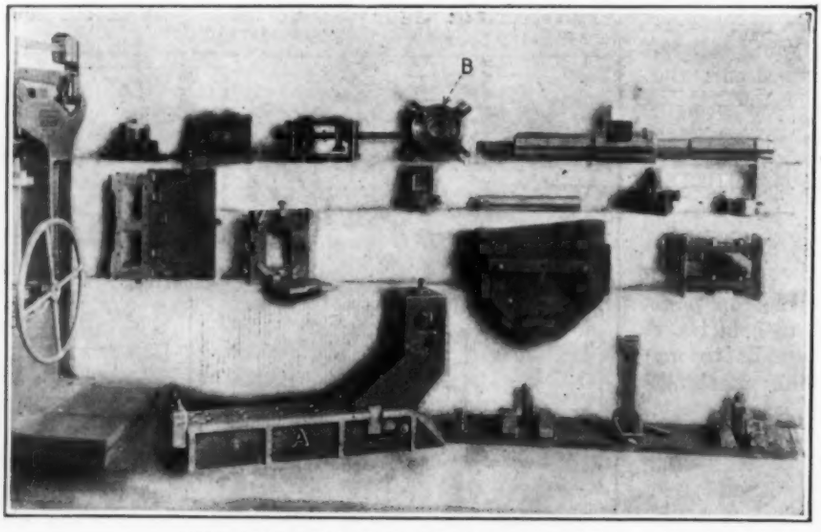
Tools made by this method are stronger as well as lighter and can be made to embody features not practicable to secure when made from castings. For instance: it is desired to place a screw in a position that would be impossible to reach in the casting for the purpose of drilling and tapping; with this method of construction we have only to drill and tap a piece of steel of suitable shape and then weld it in place. The large jig *A* in the foreground has a screw in such a place for holding and supporting the work.

Square holes to locate and hold toolbits in a boring bar, difficult to make by the usual methods, are very easy when welding is available. Simply mill a slot diametrically across the end of the bar, weld in a piece of steel to close the slot, grind off the flash and you have a square hole. If the toolbit is to be held with a wedge instead of a setscrew, mill the bottom of the slot to the desired angle before welding in the piece.

The testing machine, part of which is shown at the extreme left of the picture, was originally provided with a crank for turning the elevating screw of the table. The crank was rather awkward to use and we substituted the handwheel, which we made from cold-rolled steel in two hours.

Repairs to and alterations upon tools are easy to make, since broken tools can be welded without appreciable distortion, and if it is found after a tool has been placed in service that a boss here or a lug there would be advantageous; it can be added without trouble or delay.

The pot chuck *B* was wanted in a hurry, and it was in use the same day. Had we been obliged to wait for a casting there would have been a delay of at least two days before we could really have started to make the tool. From our experience we have found the arc welder has effected the greatest saving of any method in building tools and we would hardly know how to get along without it.



Examples of tools made by arc welding

Grinding Thin Gage Blocks

BY H. J. GUSTAV KOPSCH

Some time ago I was asked to make a number of gage blocks 8-in. long, ¾-in. wide and having thicknesses of 0.187, 0.1875 and 0.188 in., respectively. They were to be made of tool steel, hardened, ground, and lapped to within 0.0001 in. in thickness. The length was unimportant. The width could easily be held within 0.0002 in.; but nobody had been able to grind them within the limits given for thickness and get them straight and flat, since they would spring or warp.

The work was done on a Brown & Sharpe surface grinder. The blocks were ground to within 0.002 or 0.003 in., cigarette paper being used to pack under the hollow spots.

After truing the wheel, and slightly rounding both corners, I demagnetized the gages, and testing them on an accurate surface plate, I found out where they did not touch. The least bit of spindle oil was put on the hollow places, wiping off and distributing the thin film of oil in such a way that the gages would have contact all over when put on the magnetic chuck. Without magnetizing the chuck, but depending simply on the adhesion of the gage to the chuck, it was easy to take a few fine cuts with the wheel until one surface was true. Repeating this process a few times, I managed to get the gages within the given limits and so nearly straight that any two would "wring" together. I believe that this idea of using a very thin film of oil for packing might be used in other cases, especially since it can be "tapered off" and thinned out, which cannot be done with any other material.

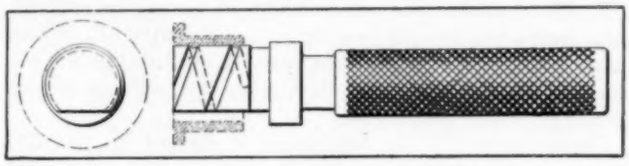
The safest rule for cutting speeds and feeds is to run them up until either the cutter or the machine shows signs of overwork, and then drop down a notch, or even two.

Better Wearing Plug Gages

By Harry Kline

Plug gages used for ground holes wear out much more quickly than those used for bored or reamed holes, because, in addition to the frictional wear, there is a lapping effect when the gages rub against the small particles of abrasive left in the hole.

Gages used on one of our operations were wearing out at the rate of two a day, until the design shown in



Plug gage for a ground hole

the illustration was conceived. This gage has a helical groove and a flat to overcome the abrasive action by providing a space for the grit left in the hole. It is inserted with the flat down, since most of the abrasive naturally collects at the bottom of the hole.

By making gages this way we have added 25 per cent to their lives.

A Special-Purpose Milling Fixture

By B. J. Stern

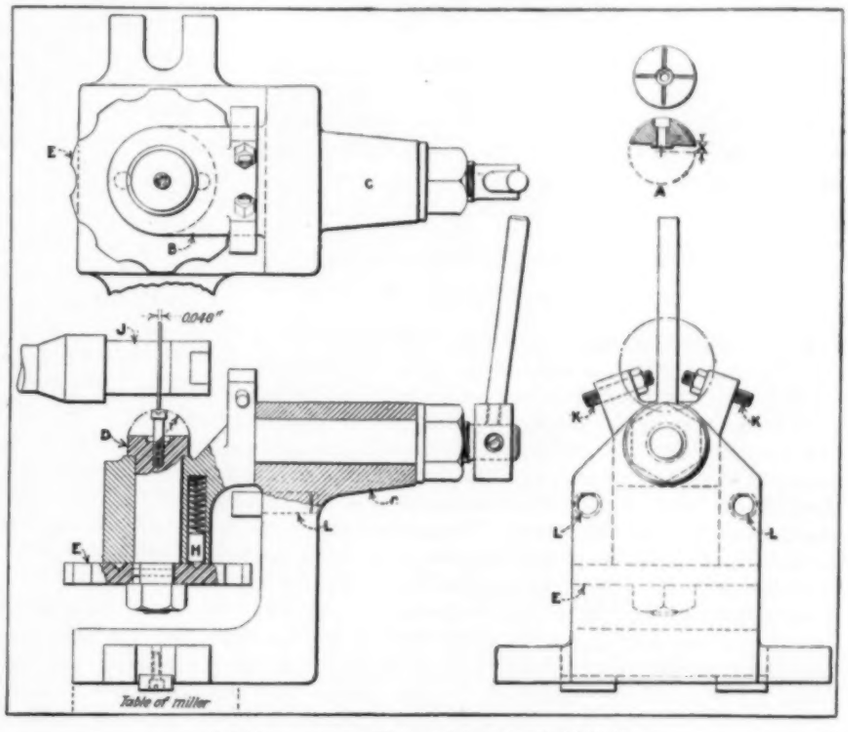
This rather unusual milling fixture is for the purpose of milling grooves of half-round section in the hemispherical part, or half-ball, shown at *A* in the illustration. The part is of brass and is machined all over, including the counterbored screw hole and the tongue on its flat side, previous to this milling operation. The grooves must be at right angles and must extend around the spherical surface of the part and stop at the distance *x* from the projected center line of the radius. The fixture is mounted on the table of a hand milling machine, to which it is aligned by a tongue fitted to the slot. The bracket *B* swings about a horizontal axis, being supported by its journal in the bearing *C*, which is a part of the base portion of the fixture. It is free to turn in this bearing, but is confined against end movement by a bronze thrust washer and a nut, which also provide a certain amount of frictional resistance to the turning movement. A lever at the end of the stud that forms the journal, furnishes the means to manipulate the bracket. The work piece is held at the upper end of the shouldered spindle *D*, being secured thereto by a fillister head screw passing through the already finished hole in the piece and threaded into the spindle itself. A slot across the end of the spindle receives the tongue on the flat side of the work piece and locates the latter with reference to the spindle. A fluted disk *E*, fitted to the lower end of the spindle *D*, and secured thereto by a key and nut, prevents endwise movement of the spindle and allows it to turn about its axis.

A spring-actuated plunger *H* confined in an axially-disposed cell in the wall of the bearing bears against the upper face of the disk *E*, in which are four countersunk spots to match the correspondingly pointed end of the plunger. These spots are located 90-deg. apart, circumferentially, and it is obvious that while the spindle may be rotated with comparative ease by the thumb and finger of the operator upon the fluted periphery of the disk, the spring plunger will offer a plainly perceptible check to its rotation in any one of four positions.

A round-edged cutter of suitable diameter and thickness is mounted upon the arbor *J* of the machine to do the cutting. The movement of the table of a hand milling machine, by means of its levers and the exactness with which it may be returned to its original position, both horizontally and vertically, against the table and knee stops, permits the fixture to be withdrawn clear of the cutter for loading and unloading.

With the table and knee against their respective stops, the cutter dips into the counterbored hole in the work above the screw head, but does not touch the screw head because of the excess depth of the counterbore. Neither does it touch the work, because the relative diameters of cutter and counterbore are such that the interrupted surface of the hemispherical part is of greater extent than the active arc of the cutter.

Swinging the bracket *B*, first to one side and then to the other until the adjustable stops *K* contact with the hardened steel stop-pins *L* set into the stationary wall of the fixture, completes one slot. With the bracket in the central position, or, better, with the knee of the machine slightly lowered away from its stop, the piece is indexed as above described into position to cut the second slot. There is need for but two of the detent spots in the disk *E*, but with four of them the work is facilitated, because the operator need not consider which way to turn the spindle to commence the next slot.



Fixture to mill grooves in half-balls

Triangle for Laying Out Octagons

By W. Hagner

It is a very simple matter for the draftsman to lay out a hexagon with a standard 30-60 deg. triangle, but an octagon cannot be laid out so easily. Where this job has frequently to be done and time becomes a factor—as it so often does—the triangle shown in Fig. 1 will be of great assistance. Use an old or broken triangle and cut it down to 22½-67½ degrees.

Another time-saving use for this triangle, shown in Fig. 2, is laying out bolt holes in pipe flanges when it

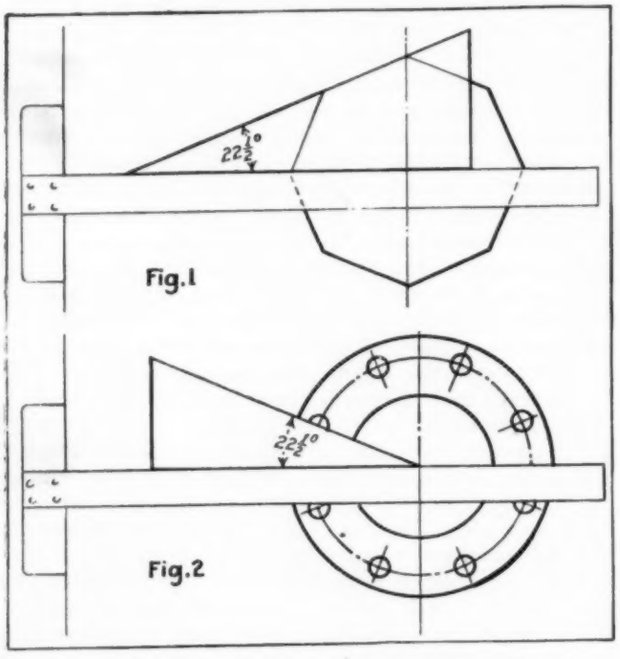


Fig. 1—A triangle to lay out an octagon. Fig. 2—Laying out bolt holes in a flange

is designed to straddle the center lines. Flanges having eight holes are: 4, 4½, 5, 6, 7 and 8-in. standard cast iron: 3, 3½, 4, 4½ and 5-in. extra heavy cast iron; 3, 3½, 4, 4½, 5, 6, 7 and 8-in. standard brass; and 3, 3½, 4, 4½ and 5-in. extra heavy brass.

A Fast-Cutting Stone Drill

By Oren Foster

Millwrights and shop men in general have work to do with stone drills in connection with the installation of hangers, shelves, machines, and other equipment.

A good stone drill, that will work fast and accurately, can be made from a twist drill by welding a piece of hexagon steel to the shank. The hexagon steel should be at least $\frac{1}{8}$ in. smaller than the drill in order to give the necessary chip clearance. The length can be determined by the average depth of the holes to be drilled. The cutting edge should be ground flat and a U-shaped groove ground in the center, leaving two points. A ¼x¼-in. groove was found to work well in a ½-in. drill and the same ratio would probably hold true for other sizes. The drill is operated in the usual way by alternately twisting it in the hole and striking it with the hammer.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Cleaning Leather Belts

Q. How can a leather belt be cleaned when saturated with oil?

A. We question the advisability of trying to reclaim belts that have become heavily saturated with oil. When this condition is reached it is very likely that the leather has lost its strength and elasticity, and will no longer transmit power efficiently.

Under ordinary circumstances it should be possible to run leather belting in the shop for many years. If your belts are not giving this service there is something faulty in the shop. On machines using quantities of oils or cutting compounds the belts should be protected from the splashing, and when once wet they should be cleaned before the saturated condition occurs. Surface dirt and grease is easily removed by wiping the belt with gasoline.

Welding Aluminum Sheets

Q. We have a problem of oxy-acetylene welding some ¼-in. aluminum strips 4 in. long at right angles to ¼-in. sheet aluminum. Can you advise us how this is done, and what is necessary? We have the gas torch.

A. The chief difficulty in welding aluminum is the removal of the aluminum oxide from the surfaces to be joined. This can be accomplished by mechanical cleaning, but it is more usual to do it by the use of a welding flux.

For welding aluminum, the parts to be welded should be cleaned thoroughly, removing all dirt and grease. The welding rod is preferably aluminum wire, or strips of the same sheet when welding aluminum alloy of an unknown composition. To get the best results in welding sheets, you should first tack weld at intervals. Aluminum welding is now very common for such articles as gasoline tanks for aircraft, and it does not vary much from other classees of welding except in the nature of the flux used. Borax, acid, and ordinary fluxes will not do for aluminum welding. A flux must be used that will dissolve the aluminum oxide The original Shoop patented flux contains 60 parts of potassium chloride, 20 parts of lithium chloride, 12 parts of sodium chloride and 8 parts of potassium sulphate. However, it is usually impractical for the shop to make up its own flux, and this is unnecessary since there are a number of commercial fluxes on the market.

Alloy for Die Castings

Q. Can you give us a formula for a good die-casting metal that will cast well and machine easily, and not be too brittle?

A. To cover these specifications it is likely that one of the standard alloys used for automobile parts will answer the purpose. The following alloy is recommended by one of the large automobile plants for such parts as throttle levers: aluminum 90 per cent, copper 4 per cent, nickel 4 per cent, and silicon 2 per cent.

Rust-Proofing Processes

Udylite

Udylite is a rust proofing process named after its inventor, Martin J. Udylite. The process consists in coating the surface to be treated with cadmium in such a way that the coating is alloyed with the base metal. Udylite coatings are claimed not to chip, check, or crack.

Udyliting is essentially a class of electro-plating, supplemented by a baking process. Iron or steel articles are given a coating varying in thickness from 0.0001 to 0.001 in. It can also be applied to other metals. The time required for plating is from one to ten minutes. The article is then baked for a period of from 2 to 3 hr. at a temperature of from 300 to 400 deg. F. The baking process is intended to cause the cadmium to penetrate the steel and form an alloy case. Articles coated by the Udylite process have a thin skin of cadmium base-metal alloy, and an external skin of pure cadmium. On bending a sheet of steel that has been Udylited there should be no indication of cracking in the surface. Udylited articles are buffed with a soft, unstitched wheel. The color is a flat-white, but when polished is very nearly like that of silver. Other metals may be plated over the Udylite coating if desired, and nickel over Udylite is claimed to stand up ten times longer than if deposited alone or over copper plate.

The principal equipment for the Udylite process consists of asphaltum lined tanks fitted with rods and connections, and a standard plating dynamo as for electro-plating. Carbon electrodes and a specially prepared cadmium solution are used. There are also provided the usual metal-cleaning solutions, scrubbing tank, hot and cold water tanks, acid dip tank, and a baking oven in which a temperature of about 350 deg. F. can be maintained. Air at 5 lb. pressure is also used for agitating the solution when a bright deposit is desired. The only difference in the equipment over that for electro-plating is that the anodes and solutions are different, and the baking oven is added.

One pound of cadmium salts will cover 134 sq.ft. of surface if applied 0.0002 in. in thickness. This depth of coating is claimed to be several times as resistant to corrosion as ordinary commercial galvanizing of 0.001 in. in thickness. The thin coat of cadmium required by this process does not clog threads or destroy close fits as is the case with the heavier coats of zinc needed for the same protection. Paints and varnishes are claimed to adhere well to Udylited surfaces. Udylited steel articles are claimed to have stood the salt spray test for 1,860 hours without rusting, while ordinary nickel plate showed indications of rust in 2 hours and peeled in 40 hours.

Cadalyte

The Cadalyte rust proofing process is essentially the electro-plating of cadmium on a base metal. The chief points claimed for the process are that the solution is easily prepared and will not deteriorate rapidly, and that it will produce an effective coat of cadmium in a short time.

Cadmium is a soft, ductile metal which does not form basic salts as readily as zinc, and is therefore less subject to corrosion than zinc. It is above iron in the electromotive series, and is thus a better rust proof coating for iron or steel than either tin or nickel. Any metal covering that is below iron in the electromotive series only protects the iron as long as the coating is intact, and will accelerate corrosion if the coating is broken or pitted.

The material to be Cadalyted is cleaned in the usual manner, and the equipment for the process is similar to that for other classes of electro-plating. Cadmium anodes only should be used, and they should be sufficient in surface area to equal the maximum surface of the articles to be plated at any one time. A high current density is used in the plating bath, and at the rate of 30 amperes per sq.ft. about 0.001 in. of plate thickness can be deposited in 10 minutes. The voltage is regulated so that the current flowing will produce a slight evolution of gas at the work. At this point the maximum rate of plating is attained, and the brightest deposit produced. Increased rates of deposit can be obtained satisfactorily by increasing the voltage if the solution is agitated.

In a Cadalyte plating bath all of the cadmium deposited on the work is taken from the anodes. This results in a constantly uniform composition of the solution. The solution does not decompose readily upon contact with the air. No heating is required, although it will operate satisfactorily at temperatures up to 130 deg. F. Cadalyte solutions do not need special reagents, and any mechanical loss is replaced by the addition of more of the same composition. The coating of cadmium produced by the Cadalyte process is dense, ductile, and adherent, and presents a somewhat polished appearance when removed from the bath.

A Cadalyte coating is claimed to give a corrosion resistance as great as a plate of zinc several times as thick. This fact makes it especially valuable for the rust-proofing of bolts, screws, and nuts, where a thick plate would require undersized threads or re-threading. Cadalyte coating, moreover, is especially resistant to salt water corrosion, and is therefore useful for marine work. Cadalyte coating can also be used as a flash for nickel plating, thereby combining the protective properties of cadmium with the high polish that can be obtained on nickel.

For the information given we are indebted to the Udylite Process Co., and the Grasselli Chemical Co.

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Technical Abstracts

Safe Loading of Cables, Chains and Eyebolts

When machinery parts are lifted, account must be taken of the increased stresses in the individual slings when a load is lifted by two or more slings connected to the crane hook and making an angle with each other. On account of the angle between the two sets of ropes, the stress on each set is greater than half the total load, increasing rapidly as the angle between the sling and the work is decreased. An angle of 45 deg. between the sling and the work makes the stress in each sling nearly three-quarters of the total weight being lifted. For a triple sling connecting to the work at three points 120 deg. apart, an angle of 45 deg. between the sling and the work gives a stress in each sling equal to nearly one-half the total weight and a collapsing force of one-third the total weight. For an angle of 20 deg., which should never be used if avoidable, these forces are approximately equal to the total weight.

For a quadruple sling connected to the work at four equidistant points, the stress in each sling may be one-half that in each half of a double sling for the same angle between the sling and the work, but in all such multiple slings due allowances must be made for the fact that they cannot all be pulled up equally tight, and that several slings will not share the load equally. For this reason, three slings are generally preferable to four.

Using chains for lifting is an entirely different problem from that encountered with either hemp rope or wire cable. Chains, outside of a few bruises or bent links, give no indication of their condition. The links may be full of cracks too small to be seen with the naked eye, or they may be badly crystallized from long use. Under these conditions, the chains grow rapidly weaker with every lift and may fail at a fraction of their rated load.

Eyebolts have been the cause of many accidents because of improper use by thoughtless or ignorant men, so that their use deserves special consideration. Most failures come from using them to take the load at an angle. In general, they should fit fairly snug in the tapered hole and the strain must be in a straight line with the threaded shank. If there is any question about condition, don't use them. Eyebolts for miscellaneous work should not be painted, as the paint may fill or cover cracks or flaws. They should be tested occasionally and always when being used for anything near their rated strength. Screw the eyebolt snugly in the hole and tap it smartly with a light hammer. The blow should not be heavy enough to bend the bolt, but just a light quick tap. If the bolt does not "ring clear," one of two things is wrong—the bolt is too loose in the hole or it is cracked. Tap it again with the finger tips held against the junction of the work and the bolt; if there is any appreciable movement or the bolt does not feel solid, be careful. It is better to get another bolt or use some other way of making the lift.—By N. L. Rea, *Power*, May 3, 1927.

Equalizing Production

The production program in the Moto Meter Co. has been so arranged that a fairly uniform schedule of manufacturing is maintained despite sales fluctuations of one hundred per cent. The scheme is to manufacture for stock, which accumulates in the slack season and is depleted in the busy one. Incidentally, all vacations are arranged for two weeks in August, the dullest season, at which time inventory is also taken.

The actual production program is determined by a foresight department, which is in contact with both sales and purchasing divisions. The amount of business is predicted six months ahead by analyzing past sales and orders on hand and correlating this information with stock records. When the foresight department is ready to put a new lot of Moto Meters in production, it ascertains, first, that finished parts supplied from outside are on hand and parts to be finished are ready to go through the manufacturing processes. Orders are then issued for one month's production on standard forms, alike for each department.

With this system, production costs are at a minimum, employment is stabilized, and hence turnover reduced. The skilled workers who are thus retained are a valuable asset to the company. These gains more than offset any theoretical losses due to high inventory. The plant is thoroughly modern and assembly is largely by special conveyors.—George H. Townsend, *Manufacturing Industries*, May, 1927.

The Annealing of Copper

When a metal that has been cold worked is heated to a certain temperature the grain structure is replaced by new grains, the hardness disappears, and the tensile strength is decreased. The grain-structure change is called recrystallization and the temperature at which it takes place is called the recrystallization temperature. For copper it is about 390 deg. F., although it varies with different amounts of cold working. When metals are worked at a temperature above the recrystallization temperature they are said to be hot worked.

The temperature of copper, for annealing, must be carried above the recrystallization temperature and therefore it depends upon the cold working that the metal has undergone. The temperature of recrystallization must not be materially exceeded, otherwise the quality of the copper is impaired and heat is wasted. The recrystallization temperature is critical in that only a few degrees below that temperature the time required for annealing is indefinitely prolonged.

Usually it is important that the surface of the annealed copper be free from oxidation. This requires that the atmosphere of the heating chamber be free from air, or oxygen. Commercial copper contains a certain amount of Cu_2O purposely left in the metal to improve its ductility and strength. If the atmosphere of the heating chamber is reducing, the Cu_2O is reduced and the copper is made brittle.

The metallic resistor type of electric furnace is especially suited for the annealing of copper in that the temperature can be definitely maintained by automatic control. The atmosphere found best is superheated steam at a low pressure.

A commercial efficiency of 29 lb. of annealed copper per kw.-hr. has been obtained. If it is necessary to put wire on spools into the heating chamber, more heat will be required on account of the spools.—N. R. Stansel, *Fuels and Furnaces*, May, 1927.

Small Sheets Save Money in Body Building

The Pierce-Arrow Co. find it advantageous to use comparatively small punchings in making bodies, and to weld these together instead of stamping large sections. The saving comes both from the reduced cost of tools and also from the saving of waste in material.

Aluminum melts at 1,215 deg. F. and assumes a pasty condition before reaching the melting point. It melts very fast, and for that reason a small, light blow-pipe is used. A No. 3 tip has been found best for sheets of 14 and 15 gage, and a No. 2 for from 16 to 20 gage. Acetylene gas mixed with oxygen under pressures of 3 to 5 lb. per sq.in. gives a very good flame, the fuel mixture being proportioned by the operator on the basis of practical experience. In starting a weld on thin aluminum sheet, a small filler rod is used, usually in the form of a narrow strip sheared from the sheet or of ⅛-in. aluminum wire of 98 per cent purity. Strips are the cheapest, and when used with proper tips and torch give very satisfactory results.

Oxide forms on the surface while the metal is being welded, and must be removed, the Pierce-Arrow Co. using a flux for this purpose. Any that remains on the surface after the weld is completed is removed by washing with warm water and is finally blown with steam. Butt welds are used on all the

joints, and, to insure solid material in the weld, every inch of it is hand-hammered after it has cooled, which increases the hardness and strength but reduces the ductility to some extent. As proper hardness is one of the essentials of a body sheet, the Pierce-Arrow Co. use what is known as 2-S-6 gray plate that is half-hard, this being easier to handle than soft material and sufficiently ductile to permit rolling, flanging, bending and grooving.

If the metal becomes too hard, through cold working, it can be annealed by heating with a gas or gasoline flame to a temperature just sufficient to cause a piece of paper to leave a brown mark when rubbed against the metal. This heating, however, must be uniformly done, and overheating results in grain growth and brittleness. The reason for welding the joint is that no satisfactory solder has been found for this purpose. The sheets are cleaned of oxide formed during the welding process by first dipping in boiling water, then in a 2 per cent nitric acid solution and are finally rinsed in hot water to remove all traces of acid.—P. M. Heldt, *Automotive Industries*, May 7, 1927.

Milling Machine Guards

In view of the large number of accidents occurring in connection with milling machines, a draft of regulations has been tentatively prepared by the Home Office, Factory Dept., London, with a provision that the cutters of horizontal milling machines shall be completely incased with the exception of the actual cutting surface. Opinions have been invited on this measure. Although many employers have already provided milling machines with suitable guards, the practice is by no means general.

The draft specifies that the floor surrounding every horizontal milling machine shall be maintained in good and level condition and that effective measures be taken to prevent it from becoming slippery. The machines must be adequately lighted, and where artificial lighting is used, no direct rays must enter the operator's eye. The cutter guard is to inclose the cutter and is to be provided with a slide flange extending beyond the root of the teeth. When coolant is used, the operator should be able to apply the lubricant and adjust the pipes without risk to himself.—Note in *Engineering*, April 29, 1927.

Factors in Determining Proper Center Distances for Leather Belt Drives

In all belt drives it is safer from both operating and cost standpoints to be conservative. Pulleys that are slightly out of round, for instance, which is often true of improperly installed split pulleys, place an uneven strain on the belt that cannot be absorbed easily unless there is a suitable distance between the center distances. In other words, the uneven strain on the belt which is caused by the pulley being out of round must be distributed over a fair amount of the belt's length if the strain is to be properly absorbed and not transmitted to the next shaft in the form of a shock load.

Where moderate center distances are used, the weight of the slack strand of the belt is sufficient to maintain a suitable tension without calling upon much of the belt's elasticity. Where short centers are used, however, the total pressure of the belt on the pulley is maintained largely through the elasticity of the belt. When it is necessary to call upon the elastic properties of a belt to maintain perfect tension, a certain amount of stretch is inevitable and the tension necessary to transmit the load soon falls below the point where it is satisfactory.

When it is not possible to change the center distance, but the drive can be changed to put the slack side on the bottom, the amount of stretch or sag in the belt does not interfere with the operaion of the drive. In fact, the weight of the long belt assists in maintaining adhesion to the pulley surfaces. For high-speed belts, where the load is variable, short center distances are more suitable than long centers. With the short centers, the flapping of the loose strand of the belt, which may result from any unevenness of the load, is markedly decreased.

A vertical drive laid out with long centers invariably causes trouble because of the necessity of frequent take-ups. A short center cuts down the percentage of stretch in the belt in proportion to the decrease in the length of the belt. The number of take-ups, therefore, is much less for the short-center drive. With vertical drives the belt must be shortened frequently to maintain the proper tension and adhesion on the lower pulley.

When it is neecssary to use long centers on vertical drives, it is always advisable to allow ample width in the belt, which permits decreasing the necessary tension and so results in less strain. This condition in turn permits the belt to operate longer before it is necessary to shorten it. The diameter of the pulleys also affects the power transmitting capacity of the belt under these conditions.—By Roy C. Moore, *Industrial Engineer*, May, 1927.

Go As You Pay vs. Pay As You Go

Installment selling, though known to the ancients, was introduced into this country 98 years ago. Sewing machines, pianos, and furniture were the first commodities sold on the installment plan, but the first automobile finance company came into existence in 1912. Since that time the number of automobiles has increased more than ten times and the number of finance companies has increased to over 1,000.

Probably the total volume of installment sales in this country last year was over $6,000,000,000, of which over half was for automobiles. Since down payments are large and monthly payments are constantly being made, less than half of this indebtedness is outstanding at any one time. The average amount owing on installments is less than 4 per cent of the national income. Losses on the financing of sales of passenger cars have been smaller than on any other commodity except gas ranges. Trucks have not been equally good risks because of their commercial nature. Businesses become insolvent, but families manage to pay the installments on pleasure cars.

During recent years, in which installment purchasing has become widely popular, savings-bank deposits have increased with unprecedented rapidity, as well as life insurance and the resources of savings and loan associations. There is little evidence that the installment plan has interfered with thrift.

It is remarkable that periods of business depression have had no important effect on default losses on installment payments.

Installment selling came to us a long time ago, its growth has been continual and gradual, and it seems to be here to stay. It is subject to abuse, but it is probable that the common sense of the American people will enable them to utilize the advantages of installment buying and avoid its dangers. — Col. L. P. Ayers, *The Cleveland Trust Monthly*, May, 1927.

Hand-to-Mouth Buying

Hand-to-mouth buying is a loosely used term that must be defined before it can be analyzed. It has two different forms that may be described as reduction in the size of the average order, and shortening of the delivery period. They may occur separately or together. The decline in the size of orders is apparently a return to the conditions existing prior to the war and bids fair to continue.

In some industries rapidly changing styles of wide range have forced the reduction in individual orders. Steadily falling prices have had the same effect in others. Better methods of retail stock control also militate against the large order and against speculative buying. Some manufacturers and wholesalers have sent their salesmen out so frequently that they can hope to get only small orders. They have not analyzed the size of their orders to see whether it paid to take the small ones.

Immediate delivery is often the deciding factor in securing an order today. Seasonal openings have been abandoned by certain industries because the merchants and fabricators buy only when they need material and then want it in a hurry. Inventory losses can often be avoided by frequent purchases promptly delivered and turned over rapidly. Excess manufacturing capacity is an important factor leading to price concessions, advanced delivery, or both.

There are only three ways of alleviating the hardships of competition due to excess capacity: Patient waiting until the demand catches up; dismantling of the less efficient plants; expanding the market in new directions. The real solution of the hand-to-mouth buying problem lies in constructive merchandizing that will develop new markets or new strata of demand.—Melvin T. Copeland, *System*, May, 1927.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

The Flight

CAPTAIN CHARLES LINDBERGH'S flight from New York to Paris has literally stirred the world. In a perfect setting, a young man of ideal personality has done the impossible, and the effects have been international in scope. The honors heaped upon him are given in recognition of the means of transportation as well as the bravery of the man.

It may be expected that the impetus given to aviation will carry it a big jump forward. Enthusiasm of plane, motor, and instrument builders, the ambition of youth, popular faith in the safety of flying, recognition by capital, all have been increased, and all are necessary to the growth of a young industry. Moreover, the scoffers at airplanes as instruments of aggression and defense must perforce sing a different tune.

Of reflected glory there is ample for the airplane industry, and those who contribute to it. This group rightfully includes the developers and makers of materials, lubricants, and metal-working machines as well as motor, plane, and instrument designers and builders. Accuracy of parts and reliability of materials and lubricant, which meant perfect functioning of the entire mechanism of the ship, were necessary complements to an intrepid flyer.

Successful World Economics

ACCOMPLISHMENT can be credited to the International Economic Conference just adjourned at Geneva. Amongst other things it recommended the removal of trade barriers, declared the value of an efficient industrial organization as an aid to economic recovery, cleared up the functions of international industrial pools, and urged international statistics that should result in more intelligent management for industry.

The conference is to be commended on its recommendations for the collection of world statistics on raw materials, and studies of basic materials in which a world shortage is most feared. Intelligent world economy in industrial production and marketing is not possible without such figures and studies. In addition to the various specific recommendations there are broader benefits apparent. The world has a clearer understanding of its economic ills, and now knows what the ablest specialists think are remedies, and thus a basis for action is laid.

While the conference was called primarily to consider Europe's difficulties, it can be seen that America will also benefit. She will gain from freer trade due to the removal of Europe's trade barriers, will gain from international statistics, and finally, Europe in economic health will be a better customer than Europe in ill health. The International Economic Conference would seem to have justified its being.

The Open Road for Talent

BEING close to the big boss is more often than not a distinct advantage. Hidden out in the works may be the very man the big boss wants, but doesn't know exists, so he takes the promising man who happens to be under his nose. There should be an open road for talent—a road that could be traveled both ways. It is a handicap to the big boss not to be able to lay hands on talent the minute he wants it, just as it is a handicap to the individual to wait until he is discovered.

Whether true or not that opportunity is exceedingly sparing with her knocks, she should have the privilege of getting around easily. Fortunately for industry, the road is being opened. Foremen education, suggestion systems, even some bonus systems, are at work on it. Personnel managers, publishers, educators, and many of the big men themselves are the engineers on the job.

Work Surroundings

FEW of us stop to count up how many hours of our lives are spent in shops or offices and how few in any other single place. We spend some thought on making our homes reasonably attractive, or, if not, our wives do and we enjoy the results in our short time at home. But how much attention do we give to making the work place, where we are most of the time, anything but a protection from the weather and a storage place for tools and materials?

There was a sound idea underneath the tinsel structure of welfare work that flourished a few years ago but it was strangled by the unsound attempt to substitute welfare work for wages. We know better now. Not only from the psychological angle must adequate wages be paid the workman, but from the economic angle as well so that his buying power may be unimpaired.

But, wages having been fairly set, there is still room for improvement of the work surroundings so long as it is kept within proper bounds. It should cost relatively little and the returns from bettered morale and reduced labor turnover should more than repay the investment.

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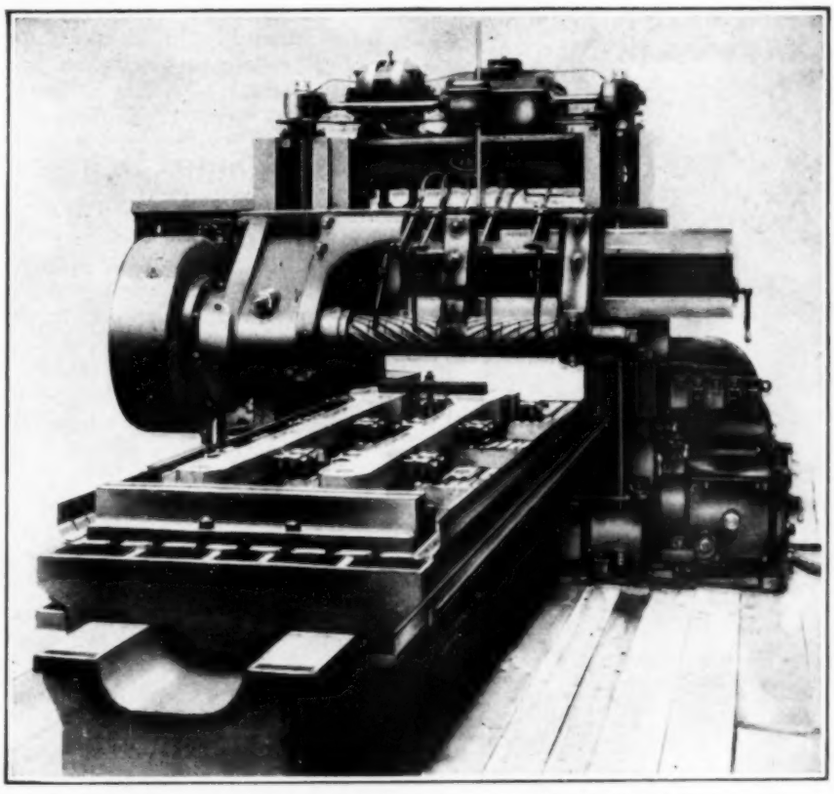
Bement 58-Inch Extra-Heavy Rod Milling Machine

THE extra-heavy rod miller shown in the accompanying illustration was built by the Niles Tool Works Co., Division of the Niles-Bement-Pond Co., Hamilton, Ohio. It has a capacity of 58 in. between the housings and a table 16 ft. long by 54 in. wide, so that six connecting rods can be handled on edge, or two flat for slabbing or channeling operations.

The improvements include a crossrail down-feed, which is entirely independent in both amount and direction of the table feed, so that the operator can select the proper down-feed without consideration of the longitudinal feed on the table. This increase in feed range is said to be particularly useful for sinking the milling cutters into the work and for securing the proper radius on the rods. It has also been possible on this account to secure a simplification and a centralization of controls at the operator's working position.

The crossrail is made in the form of an L-shaped casting and carries at its left-hand end the cutter spindle and quill, as well as the large worm-gear drive box. The cutters are driven by a 75-hp. motor mounted on a plate at floor level to avoid vibration. The motor transmits its power to the cutter spindle through a large worm and wormwheel, totally inclosed and running in oil which is constantly circulated. The worm is of steel, hardened and ground in the threads, and is carried between ball thrust bearings. The wormwheel is of manganese bronze. The crossrail is suspended by two heavy screws, rotating on ball thrust bearings at the top and anchored at the bottom to prevent buckling by upward thrusts. The rail has rapid vertical movement by power and a wide range of automatic vertical feeds, as well as hand feed for fine adjustment by a ratchet lever at the operator's end of the rail. A scale is provided to enable the operator to set the rail to correct height from the table. On the crossrail are two adjustable bearings, one to support the end of the mandrel, the other for an intermediate position. Adjustment for these bearings along the rail is by means of a rack and ratchet.

Both the crossrail feed and table feed are operated independently of the main driving motor, but the electric control equipment is so arranged that neither the table-feed motor nor the crossrail-feed motor will operate unless the driving motor is in operation; that is, these motors are electrically interlocked so that failure of current to the driving motor, either accidental or otherwise, will disconnect both feed motors from the source of power. Means are provided, however, by which either or both of these motors may be thrown in momentarily for running the table by fast traverse or for elevating or lowering the crossrail without operating the driving motor.



Bement 58-Inch Extra-Heavy Rod Milling Machine

The table feed and traverse mechanism is operated by a 10-hp. motor mounted on a gear box on the right-hand housing. The feed and traverse gears are totally inclosed and run in oil. These gears connect with the main feed shaft under the table which transmits its power by a bronze spiral gear meshing with a steel rack bolted to the underside of the table. Provision is made in the feed box by which the table may be securely locked in position to allow channeling cutters to be fed down into the work without danger of table movement, which might result in damage to cutters and the machine. Table feeds range up to 12 in. per minute and traverse up to 20 ft. per minute.

Crossrail feed and traverse are obtained from a 5-hp. motor mounted on the crosstie and driving through an oil-tight gear box to the two elevating screws. Feeds up to 3 in. per min. and rapid traverse up to 16 in. per min. are available.

A cutting fluid attachment is provided consisting of a pump and piping by which the coolant is delivered from a tank in the machine base to

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the cutters through a series of flexible nozzles so that the fluid is distributed to the most strategic points. The surplus coolant is returned to the main reservoir through adequate drains in the table.

Special attention has been directed to insure ample lubrication to all moving parts of the machine. A constant circulation is provided by two pumps. One is driven by an extension of the main-drive vertical worm shaft to insure a continuous flow of oil to the worm and worm-wheel, the other is mounted in the feed gear box on the right-hand housing and it not only serves the feed box and table drive mechanism, but also pumps oil to the vertical feed box on the crosstie. At this point also is a reservoir from which oil flows to the inclosed gear boxes at the upper extremity of each vertical crossrail screw. Separate lubricators are provided for the table ways and the table rack-gear has special flood lubrication.

The machine can be furnished complete with fixtures for slabbing and channeling as well as for edging. These fixtures are adjustable for various sizes of rods and their design has been directed toward the reduction of the set-up time and to secure greater rigidity by clamping the rods as closely to the surface of the table as possible consistent with the proper strength of the fixtures.

Bradford "Rapid Turning" Lathe

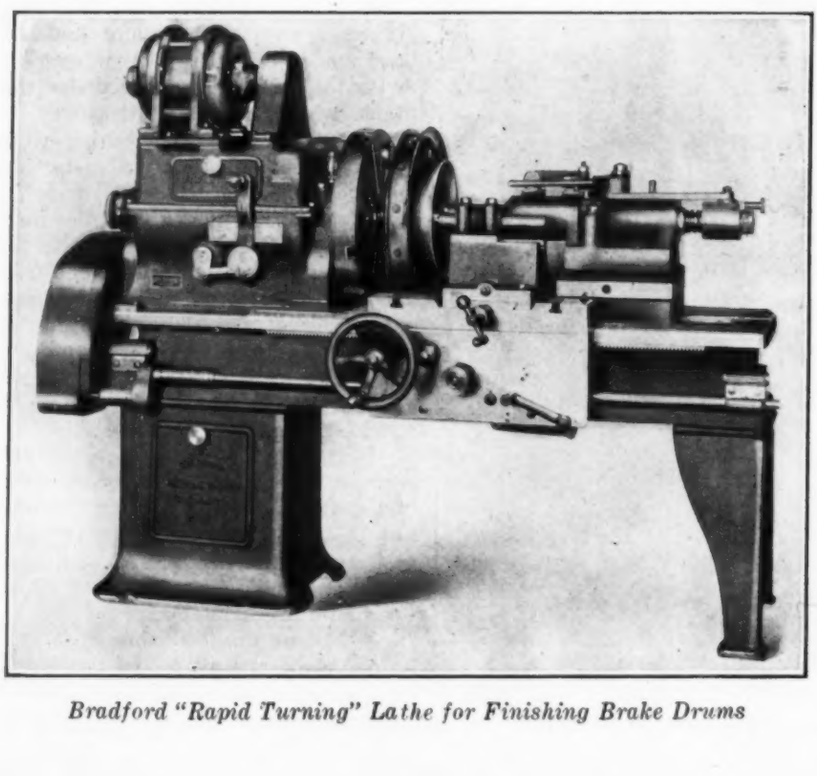
THE Bradford Machine Tool Co., Eighth and Evans Sts., Cincinnati, Ohio, has arranged the "Rapid Turning" lathe illustrated for finishing brake drums. It has a capacity of work 22 in. in diam. over the ways.

The carriage on its cutting trip is automatically stopped when it comes up against a collar on the feed rod. This collar is adjustable along the rod so that the cutting travel of the carriage can be regulated to suit the length of the work. A positive adjustable diameter stop on the carriage bridge is also provided as well as a quick hand return for the carriage, following the action of the automatic stop. Power rapid traverse of the carriage can also be provided when turning long work between centers.

The lever shown in the front of the head has an operative and inoperative position. In its inoperative or non-clutch position a mechanical friction brake is automatically applied to the spindle to effect a quick stoppage of the work.

The work arbor is seated in the end of the tailstock spindle with a No. 5 Morse shank. The pilot end of this arbor in the work comprises a ball bearing to take the thrust caused by the pressure of the heavy, square spring back of the tailstock spindle as the latter is advanced and pressed up against the work. The horizontal lever mounted on the top of the tailstock barrel serves both to advance the tail spindle as well as to lock it at the termination of the forward stroke. The heavy spring permits the pressure back of the ball thrust arbor to be suitably adjusted so as to firmly hold the work and yet not cause an undue end thrust between the contacting parts. A separate sliding shoe dovetailed into the top of the rear spring block, permits the whole tailstock spindle, including the rear spring block, to be advanced against the work without releasing the tailstock holding bolts or without altering the spring pressure, which can be suitably adjusted to the particular work in hand. The quick release and recession of the tailstock spindle is also effected by the horizontal lever on top of the tailstock.

When turning brake drums the guaranteed floor-to-floor time is 2 minutes.



Bradford "Rapid Turning" Lathe for Finishing Brake Drums

"Footburt-Sipp" Improved Sensitive Drilling Machines

An improved type of motor mounting is now being applied to the "Footburt-Sipp" sensitive drilling machines made by the Foote-Burt Co., Cleveland, Ohio. As shown in the photograph, the motor is mounted in a vertical position on the rear of the column.

No gears are used in the drive. A constant-speed motor is connected direct to the vertical drive shaft, on the top of which a four-step cone pulley is mounted. The drive is then transmitted by an endless belt to the forward cone pulley, which is mounted directly on the spindle. Four speeds are available of 544, 870, 1,360 and 2,180 r.p.m., respectively.

It is possible to change from one speed to another quickly by turn-

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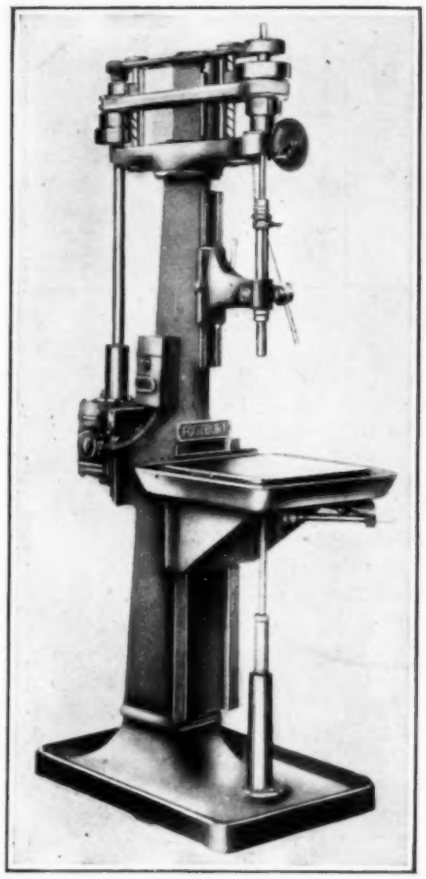

"Footburt-Sipp" Improved Sensitive Drilling Machine

ing the quick-change lever. The feature of automatic idler pulleys has also been retained so that the belt can be kept tight and up to its full pulling capacity at all times. On multiple-spindle machines, it is possible to keep the center-to-center distance of the spindles down to 8 in. by staggering the mountings at the back of the machine. This was not possible when the motors were mounted directly on the spindles, because of the diameters of the motors themselves.

The motors used are rated at ¾ hp. at 1,800 r.p.m. and are of the fully-inclosed type, so that there is no possibility of getting dirt into the armature and fields, with its attendant troubles.

This type of mounting is now available on the largest size of Footburt-Sipp sensitive drilling machines which has a capacity for drilling holes ⅞ in. in diam. in cast iron. It can be applied to one spindle or any number of spindles up to eight and can be used on machines having an overhang of 8 or 12 inches.

O. K. Boring and Facing Tools

THE O. K. Tool Co., Shelton, Conn., has added to its line of rotary cutting tools several forms that are more or less special in their primary applications, but, because of the flexibility of the O. K. system of holding the cutting blades, are capable of adaptation to many kinds of work.

All of the tools are made with the regular serrated-back type of inserted blades by means of which the original diameter of the tool may be restored, after it has become reduced through wear, by removing each blade and replacing it in the next succeeding position in the holder. When all of the blades have been advanced radially by a definite increment, the tool may be reground to size. This transposition of the blades may be repeated indefinitely, provided sufficient width of blade remains to secure it firmly in the holder.

The trepanning tool shown in Fig. 1 is made in two main parts; the shank and driving plate is a single forging to which the body of the cutting tool is attached by fillister-head screws let in from the back of the plate. The strain of driving is sustained by two or more radial keys. While all of the blades cut upon their ends, they are so arranged in the holder with reference to their radial positions that alternate blades also cut upon their outside and inside edges, respectively.

Two types of multiple boring tools are shown in Figs. 2 and 3, adapted to the counterboring of recessed holes of two or more diameters that can be finished simultaneously. One of these is made with a taper shank integral with the larger body while the smaller body has a parallel shank to seat in the larger one and is secured therein by means of suitable setscrews. The other is made with a straight shank (it can also be furnished with a taper shank, if desired) and is provided with a pilot. In this latter tool the largest body, which in this case carries chamfering cutters only, is made integral with the shank and the two smaller ones are keyed to the pilot, a long shoulder of which passes through an axial hole in the shank and is secured by a nut screwed upon its threaded end. Radial keys take the thrust of driving.

Adaptation of the same principle of holding the blades is applied to a hollow mill as shown in Fig. 4. Transposition of the blades in this tool advances them radially inward instead of outward, so that its diameter may be restored by changing the blades as before described and regrinding the tool internally. Tools of this class are usually used in connection with a jig or fixture, and the diameter of the body is ground to fit the guide bushing of the latter.

The boring head shown in Fig. 5

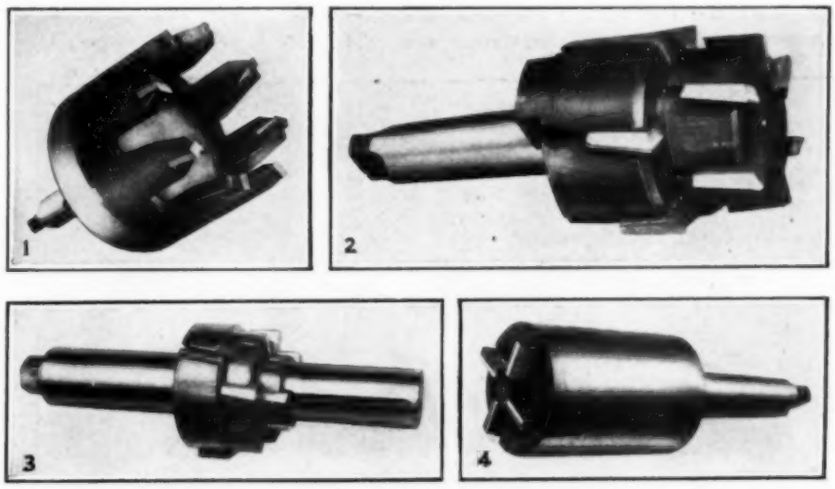

Fig. 1—O. K. Trepanning Tool. Fig. 2—Boring Head, two diameters Fig. 3—Piloted Boring Head, two diameters and chamfer. Fig. 4—Hollow Mill

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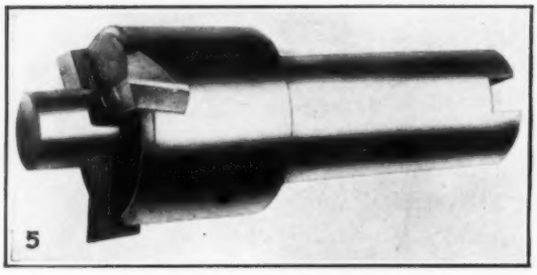
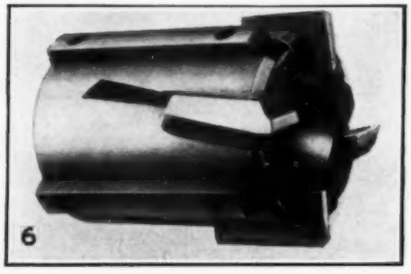




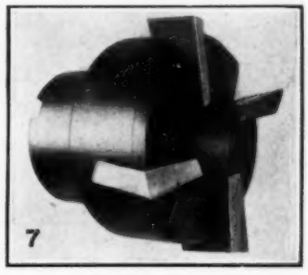


Fig. 5—Boring Head with Renewable Pilot Strips. Fig. 6—Facing Tool for Keyed Arbor
Fig. 7—Facing Tool with Inserted Pilot

is intended to be used with a keyed shank, or arbor, and has a pilot body consisting of four or more bearing strips that may be set out by placing thin packing under them, thus restoring the original diameter. The facing heads, Figs. 6 and 7, have the serrations of the blades and holders disposed longitudinally, so that by transposition the blades are set out from the body in a direction parallel with the axis of the tool. The first of the tools is intended to be used with a keyed arbor and the other has an integral shank and inserted pilot.

In all of the tools the cutting blades are made of high-speed steel and the bodies of heat-treated chrome-nickle alloy. The minimum diameter in each case is about 1½ in., and any of them may be furnished in any reasonable diameter above that size.

Baker Elevating Truck with Chain Lift

THE Baker-Raulang Co., Cleveland, Ohio, has announced their Series D elevating truck, involving a lifting principle that is said to be unique. The under side of the platform is fitted with four steel inclines that run against hardened steel rollers pinned to the truck underframe. The platform is pulled up these inclines by two roller chains. The maximum travel of the platform is 9 in., with a net lift of 6 in. Two additional rollers operating against the top of the forward inclines prevent the platform from tipping, regardless of the distribution of the load.

The lifting unit consists of an inclosed compound-wound motor operating through a triple spur-gear reduction and a fourth reduction consisting of a double set of planetary gears working in parallel. The motor drives two hardened steel pinions which wind up the two lifting chains.

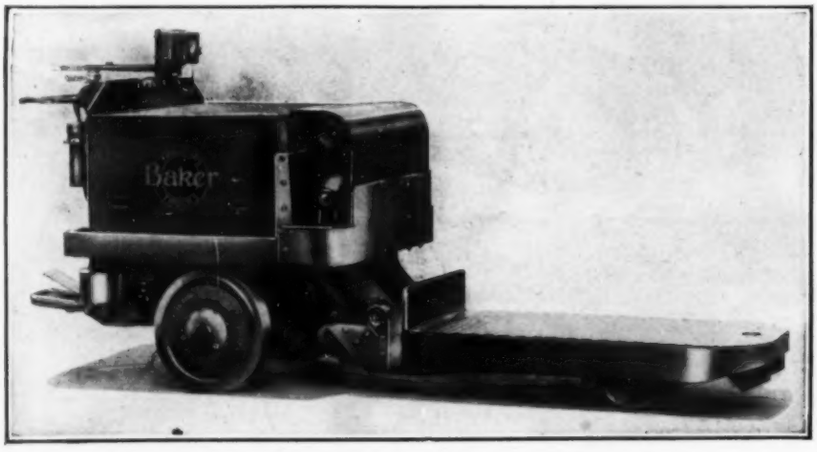
A limit switch operated by a rack and pinion opens the hoist motor circuit at both limits of travel. The control switch for the elevating motor is mounted on the dash, where it is accessible.

The frame is entirely fabricated from structural steel. The remainder of the parts of this truck are Baker standardized units and are interchangeable with similar parts on all other Baker models.

The driving axle consists of a Baker series-wound vehicle motor, driving two 20-in. wheels through a wormwheel reduction and a four-pinion, double-gear differential. Drive shafts are chrome-vanadium steel and the universal joints are 3½ per cent nickel-steel forgings. The wheels are provided with ball bearings. The trailing axle is an alloy-steel forging and each wheel runs on an individual knuckle that is fittted with two Hess-Bright ball bearings.

The controller is a standard Baker all-metal drum controller with renewable segments; the fingers have both reversible and renewable tips. The automatic switch consists of a solid-copper stationary contact and a laminated moving member, which makes a wiping contact. Auxiliary carbon contacts are provided to make or break the circuit just ahead of the metal contact. This switch is interlocked with the controller and brake pedal so that it is impossible to operate the clutch except by a conscious and sustained movement on the part of the operator. Hence, accidental starting is unlikely.

The series D elevating trucks with chain lifts are built in several types, among which are the following: Type DEXQ, standard 3-ton model; Type DEAQ, 7-in. type for low skids; Type DEHQ, dock type with platform 17 in. high; Type DEBQ, 5-ton truck with elevating platform and standard 11-in. height and 26-in. width; and Type DECQ, 10-ton truck.



Baker Elevating Truck with Chain Lift

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Barnes No. 242 Self-Oiling, All-Geared Drilling and Tapping Machine

THE Barnes Drill Co., Rockford, Ill., announces an improved design of self-oiling, all-geared production drilling and tapping machine, known as No. 242. It has a capacity for drilling holes 1½ in. in diam. in steel.

In order to minimize the deflection caused by the thrust load developed at the drill, the head is made exceptionally thick from front to rear and is flanged on to a massive column. The gang table has also been designed with this end in view. Slip-block supports are placed directly under the spindle. These blocks permit varying table heights in 3-in. steps according to the requirements of the work. The table is also securely gibbed to the four column ways so that deflection is practically eliminated. If desired, raising screws can be supplied instead of slip blocks.

All diagonal transmission shafts, the crown pinion and the crown gear run on Timken tapered roller bearings, while the drive shaft and cross spindle shafts are mounted on Fafnir radial ball bearings. The spindle thrust is taken on Rollway double staggered roller bearings.

The spindle and sliding gear shafts have six splines. The spindle sleeve is made of machinery steel with teeth cut integral, and the torque is taken by hardened rollers floating free on the cross spindle. Both the spindle sleeves and the sleeve housing are bronzed bushed.

The usual feed box has been eliminated and instead a quick-change geared feed unit is entirely inclosed inside the main frame of the machine. Spur gears are used throughout and eight changes of feed are available ranging from 0.0055 to 0.062 in. per revolution. Slip gears can be supplied to change to higher or lower feeds.

Eight quick changes of geared spindle speeds are also available and are controlled by convenient levers at the front of the machine. Speeds ranging from 64 to 708 r.p.m. are instantly available, and higher speeds may be obtained by running the drive shaft faster than its normal speed, 400 r.p.m. Each spindle is driven through a multiple-disk clutch controlled by a lever on the left side of the column. For tapping operations reversing multiple-disk clutches and gears are added to the drive shaft.

On test, a 1½-in. drill was forced through a 2-in. mild-steel plate at the rate of 20.75 in. per min. with the drill rotating at 500 r.p.m. in order to test the strength of the machine.

SPECIFICATIONS

Height of machine, in.	102
Spindle taper, Morse	No. 5
Distance from center to center of spindle, in. (33¼ in. between center spindles of 6-spindle gang)	24
Vertical travel of spindle, in.	14
Vertical travel of table, in.	12
Greatest distance from top of table to floor, in.	36
Greatest distance from spindle to table, in.	29
Size of table, 2-spindle drill, in.	16x44
Size of table, 6-spindle drill, in.	16x148
Floor space, 2-spindle drill, in.	55x54
Floor space, 6-spindle drill, in.	55x158
Speed of tight and loose pulley, r.p.m.	400
Size of tight and loose pulley, 2-spindle machine, in.	14x6
Size of tight and loose pulley, 4-spindle machine, in.	20x6
Weight of 6-spindle machine with 15-hp. motor, lb.	19,700

Brown Bros. Improved Machine Vise

An improved machine vise, shown in the accompanying illustration, is being marketed by the Brown Bros. Machine Co., 815 East 93d St., Cleveland, Ohio. The device has

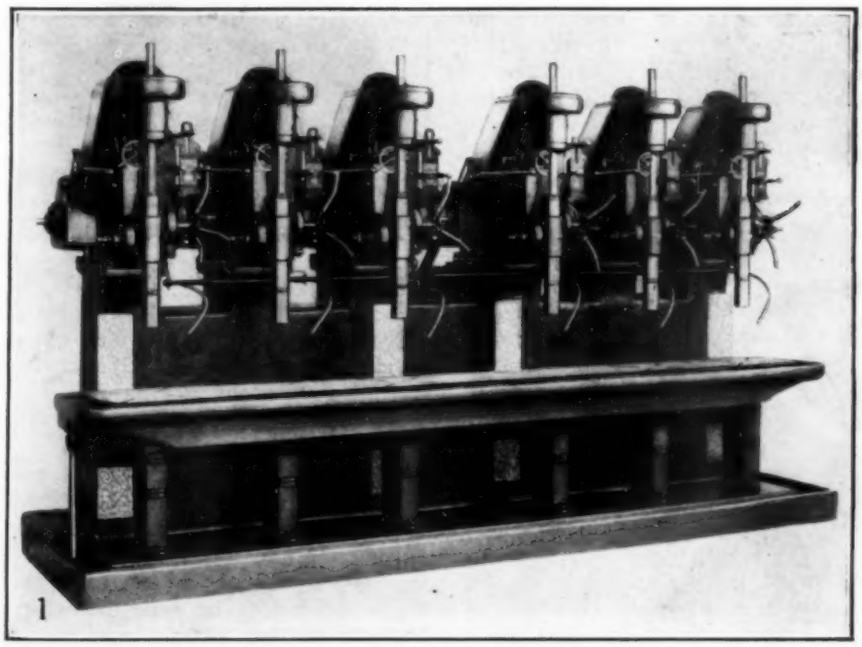

Fig. 1—Barnes No. 242 Self-Oiling, All-Geared Drilling and Tapping Machine.

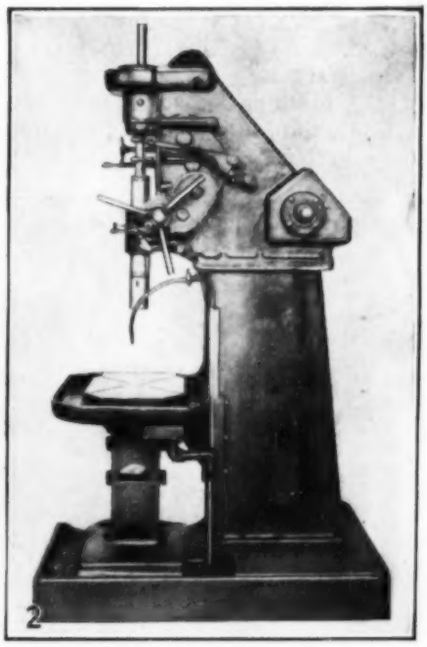

Fig. 2—Side elevation of the machine

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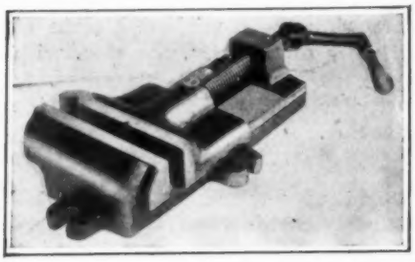


Brown Bros. Improved Machine Vise

been designed for severe service. The body and jaws are of tough, gray cast iron, while the screw is of machine steel and the handle of cast steel.

The top, bottom, and sides of the vise have been carefully machined after assembly so that it can be used for set-ups, when bolted in place. It is said that broad bearing slides and gripping surfaces, together with the large square-thread screw, eliminate shake and shifting of the work under heavy cuts. The handle is pivoted to permit easy adjustment of the work where handle-space is limited, and at the same time its permanent attachment to the screw prevents its loss.

A feature of the device is the pair of milled V-slots set vertical with the jaws; the outer and larger V-slot is approximately in the center of the overhang, which is 1¼ in., to permit handling a variety of work that must hang below the machine table. Shafts and round bars up to 1 in. in diam. and 3 or 4 ft. long can be handled for machining across the ends. The second V-slot is smaller and is located in the portion of the jaw immediately above the machined jaw-slide.

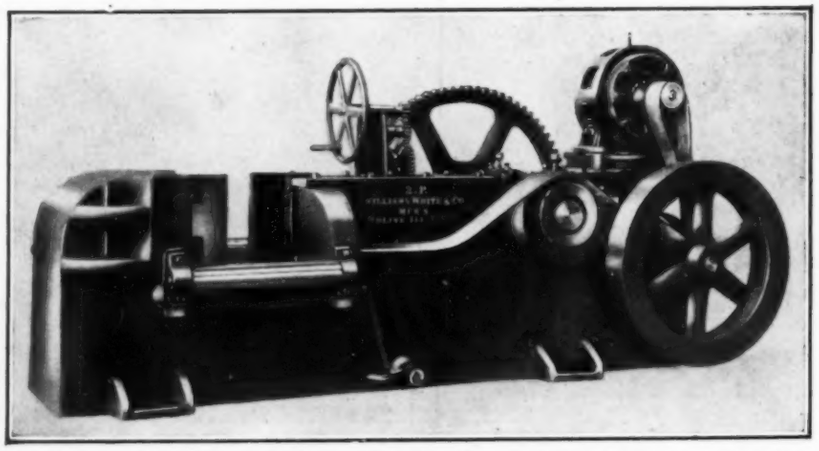
Three lugs are provided. They are flat on the top for use with dogs and are also slotted to take bolts up to ½ in. in diam. The overall length of the device is 17½ in., the width 7 in., and the jaw opening 4 in. The jaws are 1¾ in. deep. The approximate weight of the device is 25 pounds.

Williams-White Horizontal Bending and Straightening Machines

TWO bending and straightening machines of large capacity were recently placed on the market by Williams, White & Co., Moline, Ill. The No. 2-A bender has a capacity for bending 130-lb. rails or 15-in. I-beams in a horizontal plane or 24-in. I-beams in a vertical plane.

The stationary jaw face of the No. 2-A machine measures 16 x 50 in., while the jaw opening is 30½ in. The ram face is 11¼ x 11¼ in. and its stroke is 1¾ in. It has a range of adjustment of 8½ in. and 10 hp. is required to drive it.

The No. 2-P bender is illustrated. It has a capacity for bending 110-lb. rails. Its stationary jaw face measures 16 x 45 in. and the jaw opening is 24½ in. The slide face, stroke and total adjustment are the same as for the No. 2-A machine. On account of its smaller capacity only 7½ hp. is required to drive it.



Williams-White No. 2-P Horizontal Bending and Straightening Machine

These machines can be arranged either for belt or direct-geared motor drive. The machines can be furnished to operate continuously without clutch control or with clutch control, as in the machine illustrated. The clutch in this case is an automatic stop type designed by this company and is equipped with backlash pins.

The side rolls are shown mounted in a fixed position, but they can also be provided with vertical adjustment.

Van Norman Types D and E Valve Refacers

Two types of valve refacers are being manufactured by the Van Norman Machine Tool Co., Springfield, Mass., and are being distributed by the Van Dorn Electric Tool Co., Cleveland, Ohio. Both are motor driven.

The Type D valve refacer, Fig. 1, was designed for use in small service stations and garages. It will grind valves with stem diameters ranging from ¼ to $\frac{7}{16}$ in. and a head diameter up to 4½ in. A V-block is permanently attached to this machine, making it possible to grind the ends of Ford valve stems or cam followers. A universal workhead is provided graduated for setting at 30, 40, 45, and 50 deg. The workhead

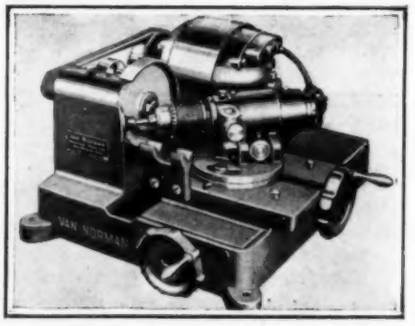


Fig. 1—Van Norman Type D Valve Refacer

and the wheelhead are driven by a single flat belt through flexible shaft, worm, and worm gear. A ¼-hp. Westinghouse motor supplies the driving power.

The Type E valve refacer, shown in Fig. 2, is designed for heavy-duty work on automobile, truck and bus valves. It may be used for grinding valves up to ⅝ in. in stem diameter, and 4½ in. head diameter. Valve reseating cutters and valve seat hones can be ground to the

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same angle as the valve. It is also applicable to grinding valve lifters, tappets, tappet screws, small spindle bolts, and the like. The workhead can be turned through an angle of 90 deg. and has a slide range long enough to grind work having a maximum diameter of 2¾ in. at the grinding point on the front face of the wheel. A 5-in. saucer wheel is used for side wheel grinding.

The Type E valve refacer is driven by two motors, which make it pos-

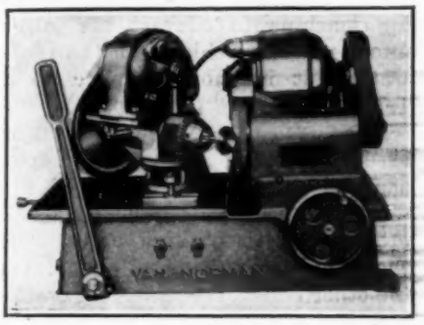

Fig. 2—Van Norman Type E Valve Refacer

sible to operate the wheelhead and workhead independently. The motors are of the high-torque, constant-speed type and of Westinghouse manufacture. A floating motor drive is a feature of this machine. In order to reduce vibration and thus produce better grinding, the motor for driving the wheelhead is mounted slightly back center on a pivoted table, producing a spring tension against the pull of the belt. A V-block is also included in the design of this refacer.

Both the Type D and Type E machines are of sturdy construction and are said to do precise and accurate work.

Zeiss Universal Measuring Microscope—Erratum

On page 913, Vol. 66, of the *American Machinist*, in describing the Carl Zeiss universal measuring microscope, the statement was made that the knife-edge method was incorporated in the instrument "since projection methods cannot be used on a screw thread." The quoted statement is in error, when left unqualified. It is only true when the absolute measurement of pitch diameters is required to a very high degree of accuracy.

Niles Improved No. 4 Car-Wheel Lathe

IMPROVEMENTS in turret toolpost construction and full-automatic driver dogs are among the features recently incorporated in the 52-in. car wheel lathe, designated as No. 4, built by the Niles Tool Works Co., Division of the Niles-Bement-Pond Co., Hamilton, Ohio.

In Fig. 1 is shown the improved tool rests, and it will be noted that the turret is provided with a cam locking device instead of the removable wedge, formerly used. All members of the toolrest are of cast steel, with the exception of the lower base piece, and all slides of the upper members are lined top and bottom with hardened and ground steel wearing plates. A hardened and ground steel plate is also attached to the underside of the turret block, which is a steel casting. The upper surface of the longitudinal slide, where the turret revolves, is lined in the same way. The central turret clamping bolt is now surrounded by a heavy spring and a ball thrust bearing so that when this bolt is released most of the weight of the turret block is absorbed by the spring without actually raising the turret from its seat. With the aid of the ball thrust, indexing can be accomplished with little effort.

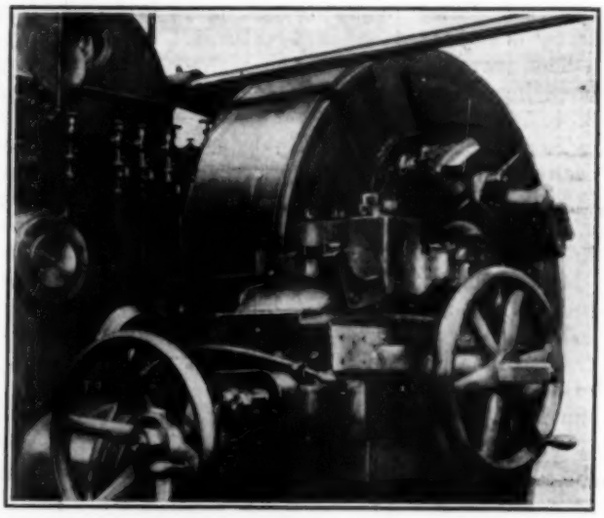

Fig. 1—Toolpost construction of Niles Improved No. 4 Car-Wheel Lathe

Each toolrest is equipped with an air hose and nozzle to clear away fine chips and dust.

The driver dogs are fully automatic in action and have a simplified arrangement for radial setting for different diameters of wheels. There are four dogs to each faceplate. From the cross-sectional view, Fig. 2, it will be noted that there are two taper blocks to each unit, the outer one having serrated teeth and the bottom one being supported by the lock-bolt shown. Normally the pressure on the spring at the side forces the serrated block up the incline, but when the faces of the wheels come against the serrated edges the dogs are forced down the incline, compressing the spring until all jaws are in contact. The wheels cannot be distorted, even though they are not true on the axle, when forced against

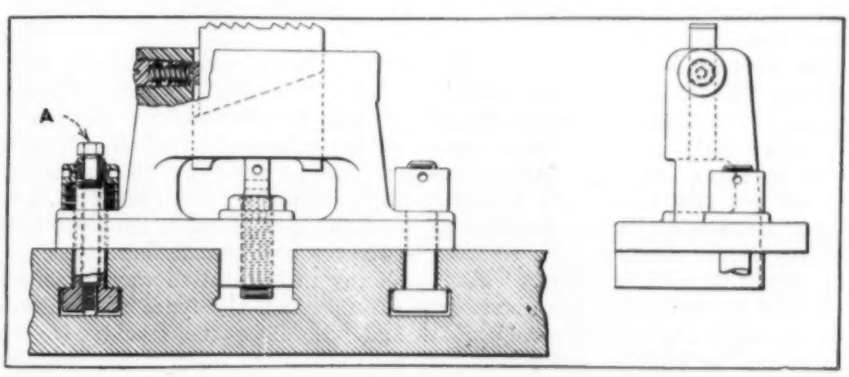

Fig. 2—Cross-sectional view of driving dogs

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the dogs, as sufficient clearance between dogs and casting has been allowed to take care of any inaccuracy in wheel rims. When the machine is started and cuts are being taken the serrated drivers mount the incline again and each dog takes its equal share of the drive. There is no other adjustment to make.

To adjust the dogs radially on the faceplate for different wheel diameters, the operator turns the small screw indicated at *A*. The large nuts are set up on the bolt by compression springs under the nuts, and the pressure of the spring is sufficient to take the weight and hold the dogs against the faceplate without slippage. To bind the dogs, the small screw is tightened one or two turns.

The traverse speed of the right-hand head has been increased from 35 to 70 in. per minute.

To provide greater chucking range, each pair of axle journal split bushings now has provision to take care of journals varying as much as ½ in. in diameter.

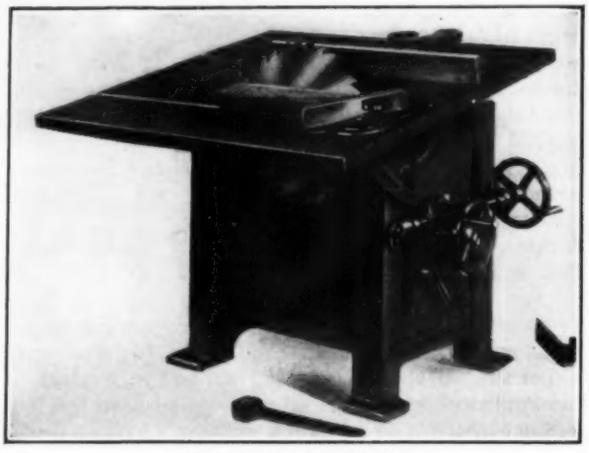
Other changes include an improved lubricating system for the right-hand head whereby oil is forced from the main pump to the reservoir in the right-hand head through piping, having a telescopic joint and running along the channels of the air hoist. Formerly it was necessary to replenish this reservoir by hand. Owing to the great swing of of this lathe and the large main spindle diameters, it is regularly equipped to turn trailer wheels having a maximum diameter of 11¾ in. over the collars. The journals are inserted into the sliding spindles and the wheels mounted on pointed centers fitting into the axle centers. In a special machine, recently built, provision has also been made whereby wheel sets having outside journals up to 10½ in. in diam. can be chucked by means of split bushings. This is effected by increasing the diameters of the main and sliding spindles. It is offered as optional equipment.

To take care of the increased weight of trailer wheel sets and heavy car wheel sets, the channels and other members of the pneumatic hoist have been made with heavier sections.

Colladay Saw Table

A saw table, shown in the illustration, especially designed for use in pattern shops and shipping departments of manufacturers, is being marketed by the Colladay Machine Works, Hope and Venango Streets, Philadelphia, Pa.

Mounted inside the base on a vertical sliding knee is a 5-hp., 3,600-r.p.m. motor, the shaft of which forms the saw arbor. This arbor is made of special alloy steel and is carried in large precision ball bearings. A handwheel on the front of the machine, operating through bevel gears, raises and lowers the knee which in turn raises and lowers the motor and saw so that the depth of cut can be varied, as required. The knee that carries the motor is mounted in dove-tailed slides, which are hand scraped. Gibs and take-up screws are provided to compensate for wear occuring in the slide.



Colladay Saw Table

The table can be turned through 45 deg., by means of the handwheel on the side, and locked in whatever position is desired. The table top, which is of cast iron, is 42 in. long and 39 in. wide and is provided with two cross-cut adjustable mitre gages sliding in key-slotted ways. An adjustable iron rip fence is furnished and will allow the machine to rip boards 17 in. wide. The machine will take a saw blade with a maximum diameter of 18 in. and a maximum projection through the table of 5¼ in. A hand starting switch is included in the equipment.

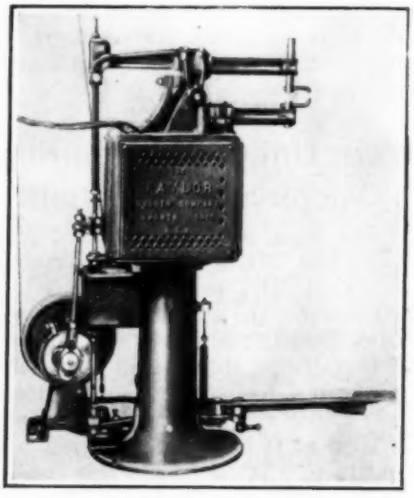
Power Attachment for Foot-Operated Welding Machines

The Stratford Manufacturing Co., P. O. Box 11, Stratford, Conn., has brought out a device to be attached to any standard foot-operated welding machine to convert the latter into a power machine. In the illustration, it is shown applied to a Taylor welder.

The device consists of a floor bracket carrying a short shaft upon one end of which is a webbed flywheel of the type used on small presses. The flywheel drives the shaft through a lock-bolt clutch. On the other end of the shaft is a crank-disk and pin, or a cam, according to the type of machine to which it is to be applied. There is also a brake to stop the rotation of the shaft quickly when the clutch is disengaged.

The device is lagged to the shop floor in suitable position relative to the machine it is to operate. The pitman or cam follower is connected to the lever of the welding machine and the treadle mechanism connected to the clutch of the device. The attachment to any standard welding machine may be made in 1 hr., it is claimed.

The object of the device is to apply pressure, uniform in degree



Power Attachment for Foot-Operated Welding Machine

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and duration, to the electrode-controlling levers of the welding machine. It is claimed that by its use the productive capacity of the welding machine is increased and the homogeneity of the welds assured for the reason that the human element is eliminated and all uncertainty due to fatigue of operator removed. The device works similar to a press; starts upon the depression of the treadle, makes one full revolution and stops automatically in the original position.

The flywheel is 12 in. in diam. and is driven by a 2-in. belt. The speed of the device is, of course, dependent upon the duration of current flow necessary to make a given weld and is determined by selecting a driving pulley of suitable size, or the unit may be driven from a variable-speed countershaft. The cam-operated device permits any desired duration of contact relative to the cycle time.

Standard Electrical Tool Co. Combination Grinding and Polishing Machine

The heavy-duty combination grinding and polishing machine illustrated is being made in two sizes of 3 and 5 hp., respectively, by the Standard Electrical Tool Co., 1938 West Eighth Street, Cincinnati, Ohio.

The motor used is a 40-deg. General Electric motor equipped with push-button control. The armature shaft is made of high-grade nickel steel and the bearings are incased in dust-proof chambers. A shaft locking device is provided for use in changing wheels.

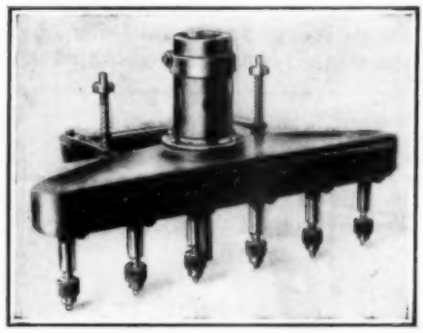
This machine is especially adapted for use with a buffing wheel and can also be used with a wire or scratch brush wheel.

Standard Electrical Tool Co. Combination Grinding and Polishing Machine

Sellew Multi-Spindle Drill Speeder

The Sellew Machine Tool Co., Pawtucket, R. I., has brought out a multiple-spindle drill speeder which is made in two sizes and in four lengths of case. The spindles of the respective sizes have No. 1 and No. 2 Morse taper holes, and the cases are 18, 24, 30 and 36 in. in length.

The device clamps to the quill of a standard drill press and is driven by a shank that fits into the tapered spindle-hole of the latter. The drive to the several small spindles is by means of a single silent chain. The small spindle units are self-contained, and each may be removed from the case by loosening four clamping screws and turning the unit one-quarter turn to the left.



Sellew Multi-Spindle Drill Speeder

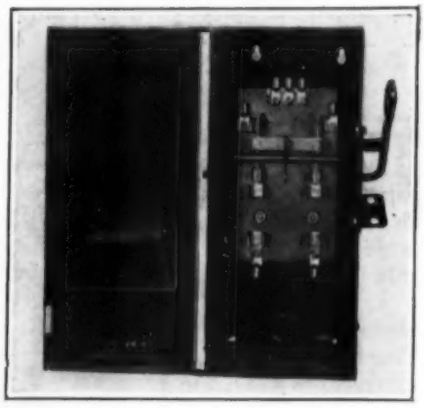
All spindles run on radial and thrust ball bearings.

The spindle units are adjustable to any position in a straight line between the two end units, and consequently the center distances may be adapted to suit conditions. The cases may be made in the shape of a circular arc instead of a straight line, if desired. The feature of the device is that it may have any number of spindles from two to the maximum capacity of the case, and the minimum distance possible between centers is 1⅝ in. When fewer than the full number of spindles is needed, the unwanted ones are removed from the case and laid aside. Altering the center distances, or adding to or subtracting from the number of spindles, does not interfere with the driving medium in any way.

The weight of the device is balanced by coil springs surrounding posts that pass through holes in a stationary bracket fastened to the face of the drill press column. The weight is small, as the case is made of aluminum.

Westinghouse Two-Pole Switch with Solid Neutral Block

The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has developed a line of two-pole switches with solid neutral block for use on three-wire grounded systems



Westinghouse Two-Pole Switch with Solid Neutral Blocks

with ratings from 30 to 300 amp. This type of switch is arranged to utilize the advantages of reduced size made possible by using the solid neutral without the third switch blade, so that the width is about the same as the standard two-wire switch.

The 30-amp. switch is of the 00 type, the 6-, 100- and 200-amp. sizes of the WK-62 type, and the 400- and 600-amp. sizes of the WK-60 type. A typical switch is illustrated.

Lincoln All-Steel Ball-Bearing Induction Motors

A complete line of all-steel, ball-bearing, polyphase induction motors, ranging in size from 1 to 100 hp., in all standard voltages and cycles, is announced by the Lincoln Electric Co., Cleveland, Ohio. In the con-

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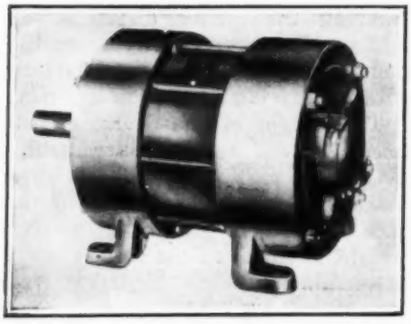


Typical Lincoln All-Steel Ball-Bearing Motor

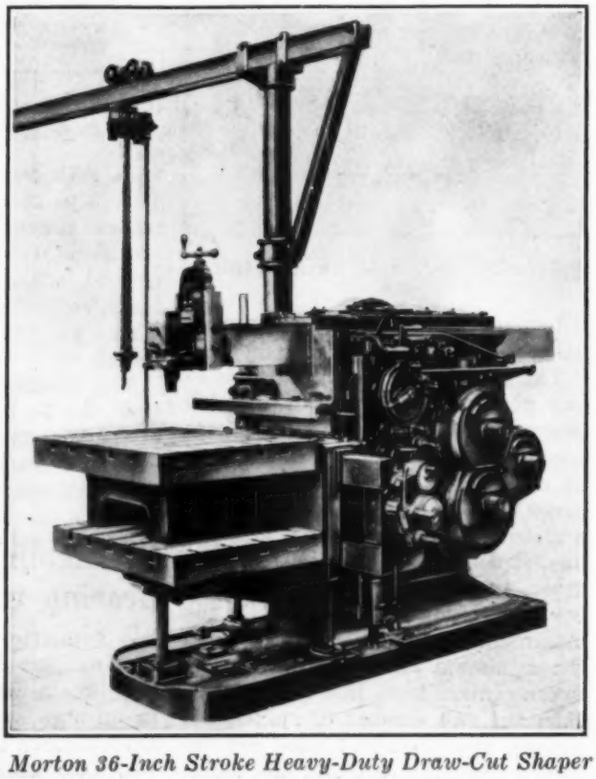
struction of these motors gray-iron and malleable castings have been entirely replaced by hot-rolled steel.

The manufacturers claim that every part of the motor is at least twice as strong as in the former type, which was built with a cast-iron frame. Drop-forged steel feet are welded on to the hot-rolled steel end rings of the motor. This feature is said to eliminate broken feet. The end brackets, or bearing supports, are also made of welded steel, giving a complete all-steel motor.

Less thickness of metal is required in the frame owing to the greater strength of steel than that of cast iron. It is claimed that the increased ventilation thus obtained results in a considerable increase in the overload capacity of the motor with the result that a continuous overload of from 10 to 50 per cent can be handled by the motor, depending upon its size and speed.

Morton 36-Inch Stroke, Heavy-Duty Draw-Cut Shaper

THE Morton Manufacturing Co., Muskegon Heights, Mich., is marketing the heavy-duty draw-cut shaper shown in the illustration with large auxiliary top table. The machine has a cutting stroke of 36 in., a vertical feed of 21 in., and a horizontal feed of 48 in. The crossrail can be extended so as to give 56 in. of horizontal feed if desired. All feeds are automatic and can be changed while the machine is in operation. The crossrail is raised and lowered by three adjustable screws. The clutches and other important parts of the shaper are automatically oiled and all bearings are of bronze. The cutting takes place on the draw stroke so that the resulting strains are applied against the column of the machine. At this point is an adjustable back bearing. The machine can be furnished for either belt or motor drive. All machines are equipped with an auxiliary table, a large T-slotted table, swivel-base vise, jib crane with two-speed hoist and a set of O.K. tools and holders. It is claimed that this machine occupies one-half the floor space and consumes one-third the power of housed planers of equal capacity. It will take various attachments for railroad work, except those for slotting driving boxes.

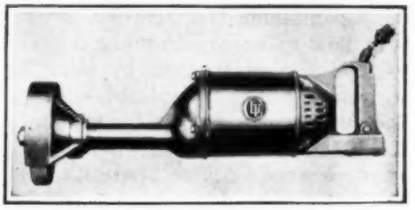


Morton 36-Inch Stroke Heavy-Duty Draw-Cut Shaper

Cincinnati Motor-Driven Hand Grinder and Buffer

The Cincinnati Electrical Tool Co., Cincinnati, Ohio, has recently brought out a more powerful universal hand grinder and buffer designated as Model NSU.

This machine is equipped with a ¾-hp. motor and carries a 6x1-in. grinding wheel, revolving at a speed of 3,600 r.p.m. Although the construction of the tool is heavier, simplified design has resulted in a weight increase of only one pound over the ½-hp. model. The tool is of full ball-bearing construction. Spiral gears, heat-treated and of ample size, are used throughout. The armature pinion is removable, being screwed into the armature shaft, and all gears run in grease in a grease-tight compartment.



Cincinnati Motor-Driven Hand Grinder and Buffer

An inclosed, patented switch is located in the handle of the grinder with a push trigger under immediate control of the operator. There is a cable clamp securing the drop cord and its protecting hose against movement and resulting wear. The wheel guard is both longitudinally and radially adjustable.

The weight of the tool is 24 lb., including wheel and wheel guard. The motor can be furnished wound for 32, 110 or 220 volts for either alternating or direct current.

Westinghouse Type OB Watthour Meters

Two types of watthour meters have been designed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., the OB polyphase watthour meter and the

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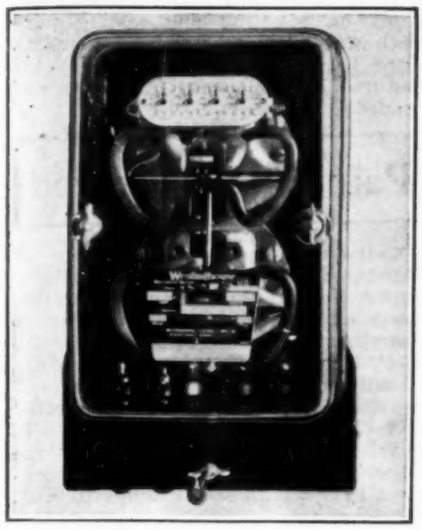

Westinghouse Type OB Two-Element Three-Wire Watthour Meter

OB two-element three-wire watthour meter, illustrated. The OB polyphase meter has all the distinctive features of the single-phase OB type and is used on two- or three-phase circuits with either three- or four-wire systems. Complete temperature compensation at both unity and low power factors is also featured.

The OB two-element, three-wire watthour meters are patterned after the Westinghouse single-element OB meter. On three-wire circuits, where greater accuracy is desired than is obtainable with the single-element meter, this instrument can be used to advantage. The power consumption does not always justify the cost of polyphase meters, and hence these two-element meters are offered.

Morton 84-Inch Draw-Cut, Traveling-Head Planer with Attachments

The Morton Manufacturing Co., Muskegon Heights, Mich., has improved its 84-in. stroke draw-cut, traveling-head planer for planing, boring, milling and slotting heavy iron and steel castings and for all heavy-duty repair work. It may be equipped with floor plates, work table, milling attachments, right-angle boring attachment, standard and traveling-head boring bars with outer support, reversible head for either push or pull cut, push- and pull-cut slotter bars and other special equipment. In Fig. 1 the complete machine is shown. In Fig. 2 is shown the vertical milling attachment with a two-piece work table. The attachment is secured to the threaded end of the ram by a circular T-slotted grip ring. The head may be turned to any 90-deg. point on the ram. A special offset boring head can also be furnished for mounting on the end of the ram similar to the milling head. Fig. 3 shows the machine equipped with a boring bar, cutter head, facing arm and outboard bearing support. With these attachments many operations may be accomplished in one setting of the work. The manufacturer also claims that this planer occupies only one-half the floor space and consumes one-third the power of a housed planer of equal capacity.

The bed is provided with large bearing surfaces and square-rail bearings. It is ribbed for strength and rigidity. The column and saddle are also of heavy construction and are made in one piece. Closely fitted to the column is the apron carrying the feeding, actuating and cutting mechanism, and the ram, which is driven through a rack, extends through the entire length of the apron. The ram is made of steel, cast hollow and square, and has a bearing on all four sides.

Driving power is obtained from a variable speed motor on the base.

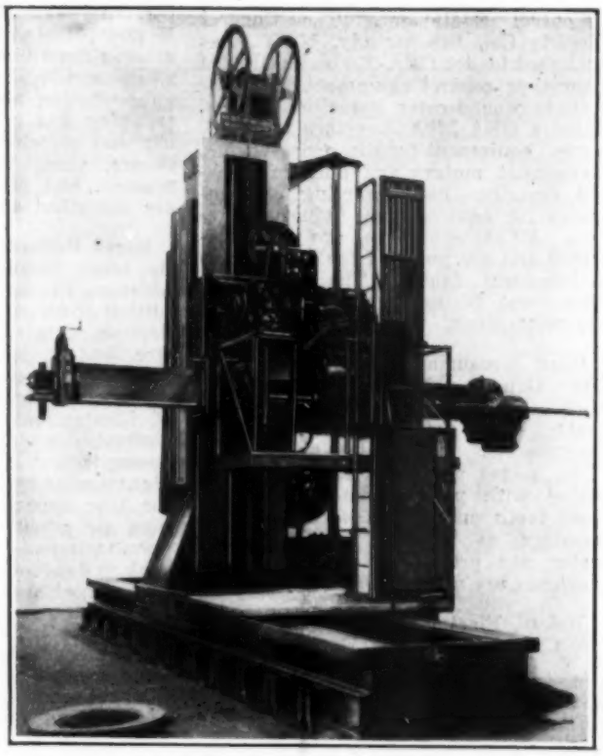

Fig. 1—Morton 84-Inch Draw-Cut, Traveling-Head Planer

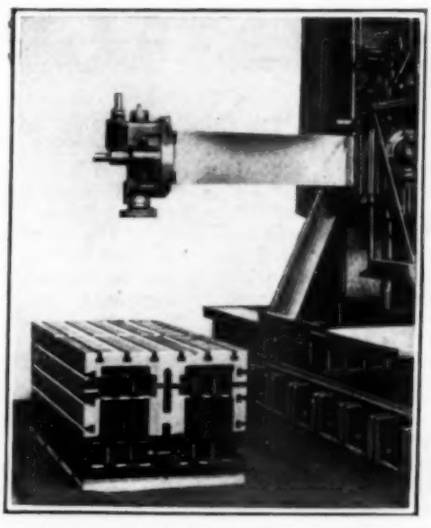

Fig. 2—Milling Attachment and Two-Piece Work Table

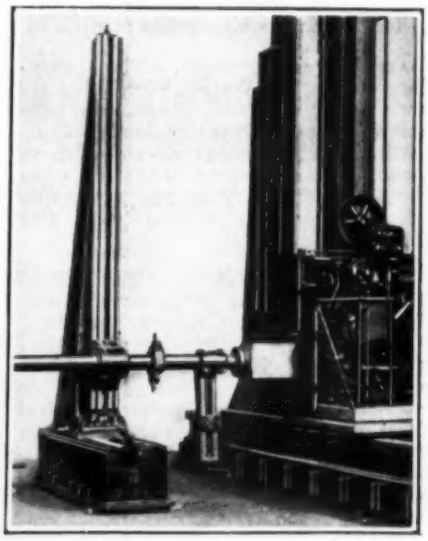

Fig. 3—Boring and Facing Attachment

Trade Catalogs

Control Equipment. The General Electric Co., Schenectady, N. Y., has published leaflet GEA-250 on its CR3204 drum-type control equipment for 2- or 3-phase wound-rotor induction motors. Bulletin GEA-530A describes type MT control equipment for d.c. series-wound, crane-hoist motors and bulletin GEA-570 describes hand starting compensators for squirrel-cage induction motors. All three bulletins are well illustrated and are punched for insertion in a loose-leaf folder. The chief constructional features of the apparatus are pointed out.

Gear Measuring Instruments. The Gear Grinding Machine Co., Detroit, Mich., recently issued a descriptive booklet on its precision gear measuring instruments. It contains sixteen 5½x8½-in. pages and is attractively illustrated with photographs and charts. Gear tooth curve indicators and comparators, as well as an eccentricity tester are presented. Gear grinding machines are also shown.

Hoists, Electric. The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., has issued an illustrated descriptive catalog on its floor-operated electric hoists. The publication contains twenty-eight 8½x11-in. pages. For each type of hoist, there is a picture of the unit itself and an illustration of its application together with a short description. The general details of construction are summarized for all units. Other Shepard equipment is mentioned.

Jacklift and Stacker. The Lewis-Shepard Co., 151 Walnut Street, Watertown Station, Boston, Mass., has published a large illustrated leaflet, illustrating the numerous special-purpose jacklifts and stackers that this company has made during the past year. Special-purpose platforms are also illustrated.

Lathe, Turret, Vertical. The Bullard Machine Tool Co., Bridgeport, Conn., has issued a 16-page catalog describing its 64-inch "Spiral Drive" type vertical turret lathe. Numerous photographs are used to illustrate the tool and its various parts, and a complete technical description of the construction of the unit is presented. Two cutting lubricant systems are also presented pictorially.

Motors, Electric. The General Electric Co., Schenectady, N. Y., has issued Bulletin GEA-6, on its "500 Series" squirrel-cage motors. By means of a number of illustrations and boxed notes the chief constructional features of this series are brought out. Some controllers for use of these motors are also illustrated.

Saws, Circular. John Royle & Sons, Paterson, N. J., has published a 64-page booklet, 4x6 in., on circular saws and related equipment. The publication is well illustrated throughout. The various types of saws are first described, followed by hints on their care. Saw conditioning devices are then presented and finally saw tables.

Sheet and Plate Machinery. The Streine Tool & Manufacturing Co., New Bremen, Ohio, has issued a 12-page catalog describing the line of "Stamco" sheet and plate machinery. Rotary gang slitting shears, squaring shears, crimping and corrugating rolls, forming and punching presses, continuous shears, sheet leveling rolls, forming presses, and miscellaneous equipment, are described and illustrated.

Speed Reducers, Spur-Gear. The W. A. Jones Foundry and Machine Co., Chicago, Ill., has published the second edition of its catalog No. 26. This publication contains 96 pages, 8½x11 in. in size, and it is attractively bound in flexible paper covers. The presentation is also well done, and a large number of illustrations enhance the text. A general description of the speed reducers is first given, followed by an explanation of twelve advantages claimed for this apparatus. Horsepower ratings are given as well as dimensional specifications. A large part of the book is devoted to a pictorial presentation of typical applications.

Speed Reducer, Right-Angle. The D. O. James Manufacturing Co., 1114 W. Monroe St., Chicago, Ill., has issued an illustrated leaflet describing its right-angle speed reduction drive. Various advantages of this type of equipment are listed.

Tiering Machine. The Standard Conveyor Co., North St. Paul, Minn., has published a small illustrated leaflet pointing out the advantages of its hand-power type standard tiering machine. Complete specifications are given both for this type and the electric-power type.

Tools, Drop-Forged. J. H. Williams & Co., Buffalo, N. Y., has issued the 20th edition of its general catalog on drop-forged tools. It is of convenient pocket size as it measures 4x6 in., and contains about 200 pages. It is well illustrated throughout. A large part of the book is given over to wrenches of various types, followed by pipe tongs, tool holders of various types, lathe dogs, clamps, and miscellaneous equipment.

Tool Steel. The Crucible Steel Co. of America, 17 E. 42nd St., New York, has issued a bulletin on its H.Y.C.C. Steel. The symbol is an abbreviation of the sentence "How You Cut Costs." The advantages and uses of the steel are first pointed out, followed by information as to how it can be forged, normalized, annealed, hardened and tempered. A large part of the booklet is given over to illustrations of various tools, chiefly die sets, made of this material.

Vise Bench. The Simplex Tool Co., Woonsocket, R. I., has issued a loose-leaf circular describing the Simplex Gray machinists' bench vise made with a steel slide. Complete specifications are given together with a price list of the various sizes.

Wire Cloth. The Newark Wire Cloth Co., 351 Verona Ave., Newark, N. J., has published Catalog No. 26 on its products. The booklet contains sixty-four 5x7½-in. pages and is well illustrated. Hints on selecting and testing wire cloth are given, as well as complete price lists. A Monel metal cloth is featured. Some useful tables are appended.

Pamphlets Received

Cast-Iron Pipes. The Bureau of Standards has available Technologic Paper No. 336 entitled "Comparative Tests of Six-Inch Cast-Iron Pipes of American and French Manufacture," By S. N. Petrenko. The testing procedure is outlined and the results of the tests are discussed. The leaflet is illustrated with line drawings and micro-photographs. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 15 cents.

"Dominican Customs Receivership—1926." This is the report for the 20th Fiscal Period by the General Receiver of Dominican Customs, Santo Domingo to the War Department of the United States. The pamphlet contains ninety-six 6x9 in. pages. It consists largely of tabular material relating to imports and exports. The pamphlet may be obtained from the Government Printing Office, Washington, D. C.

"Iron in Pigs." A report of the United States Tariff Commission to the President of the United States. A discussion of grades of pig iron is given, together with an analysis of the cost of production both here and abroad. A separate statement of Commissioner Costigan is also included as well as a proclamation by President Coolidge in regard to the increasing rate of duty on iron in pigs. The pamphlet may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents.

Locomotive Frames. The International Nickel Co., 67 Wall Street, New York, N. Y., has published in pamphlet form in full an article entitled, "Tougher Locomotive Frames," by W. A. Newman and C. F. Pascoe, that was presented in abstract form in *Iron Age*, issue of March 10, 1927, under the title "Making Locomotives Stronger." The authors compare the relative merits of frames made of high-carbon vanadium steel and low-carbon nickel steel. The pamphlet is illustrated.

Office Manager. The Policyholders' Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York, has published Bulletin No. 6 of a series on business organization entitled, "Functions of the Office Manager." The duties of this executive are pointed out and typical organization plans are presented. The technique of office management is also given in considerable detail. The pamphlet contains 60 pages, 5½x8 in., and is illustrated with charts.

NEWS OF THE WEEK

Schwab Urges Engineers to Foster Unity of English-Speaking Nations

A. S. M. E. receives testimonial from British engineers

CHARLES M. SCHWAB, president of the American Society of Mechanical Engineers, in introducing Loughnan Pendred, editor of *The Engineer*, as the principal speaker at the dinner held in connection with the spring meeting of the society at White Sulphur Springs, May 23 to 26, urged the engineers of the English-speaking nations to do their part in drawing the countries together. Mr. Pendred, in the course of his remarks, echoed the sentiment and presented a testimonial of good will from the Institution of Mechanical Engineers. The other feature of the banquet was the presentation of the A. S. M. E. medal to Wilfred Lewis for his contributions to the knowledge of the science of gears.

The holding of a spring meeting at a resort was something of a departure from society tradition and opinion as to its desirability was divided. Next year's meeting will be held in Pittsburgh in May. This announcement was made in the brief business meeting that opened the regular sessions on Monday afternoon. At the business meeting Ralph E. Flanders, chairman of the publications committee, explained the new publication plan which had already received the approval of council and its adoption was voted. Two speakers advocated regrouping of the professional divisions in order to make the best use of the new publication plan.

Simultaneous sessions were held by the American Society of Refrigerating Engineers, much of the discussion revolving around domestic refrigeration.

At the session on education and training for the industries, presided over by John T. Faig, chairman of that committee, Albert Sobey described the policy and plan of the General Motors Institute of Technology at Flint, Mich. The discussion that followed indicated general approval of the policy of a big corporation that looked to the training of its own skilled workmen and executives, thus shouldering a burden too often left to others. In the absence of Frederick E. Searle, superintendent of the Ford Trade School, Dean Sackett of Pennsylvania State College read his paper describing the school and then opened the discussion on both papers.

The final paper of this session was one by William S. Conant of Washington on "A Uniform Apprenticeship Certificate for Co-operating Groups of Employers." Mr. Conant's analysis was based on thirty-four forms of certificates collected from various types of schools in different parts of the country. He urged uniformity in training and certification so that employers could depend on the certificate presented by an applicant from a distant city.

In the management session, J. E. Hannum, director of the American Engineering Council investigation on accident and production, reported the results of the analysis of data collected from plants in twenty basic industries. At the same hour the Fuels Division put on a session which was devoted to a paper by George A. Orrok on the "Economics of Coal Carbonization in the United States." The Wood Industries, Hydraulic, Material Handling, Oil and Gas Power, and Power Divisions held sessions at which the subjects discussed were not of particular interest to the metal working field.

The Machine Shop Practice Division put on three papers: "Hysteresis Relative to the Operation of Mechanical Springs," by J. K. Wood; "Vibration of Frames of Electrical Machines," by J. P. Den Hartog; and "Arc Welding," by J. F. Lincoln. Mr. Lincoln devoted most of his paper to showing the reductions in cost possible by substituting welded steel parts for castings. He also touched on certain inconsistencies in the rules regulating the use of welding in boilers and superheaters and promptly drew the fire of the boiler code committeemen present.

Two excellent papers were presented at the Railroad session: "High Steam Pressures in Locomotive Cylinders," by Lawford H. Fry; and "Diesel Traction for Railroads," by William Arthur. Mr. Arthur, who is manager of the traction division of the American Brown Boveri Electric Corporation, told of the progress being made in various European countries in the installation of Diesel engine driven locomotives and motor cars, his observations being based on a recent eleven-months trip abroad. Transmissions, cooling and vibration are the three most difficult problems to overcome. He concluded with a statement of the relative advantages and disadvantages of steam, electric and Diesel traction, in which he expressed the belief that the steam locomotive has many years of successful operation ahead of it before it can be superseded by any other power unit.

Training and Research Discussed by Industrial Engineers at Chicago

Practicability of the five-day week given consideration

INCREASING the efficiency of the industrial engineer by proper training, the need of further research for the solution of management problems, and a broad discussion of the five-day week, were the keynotes that marked the fourteenth national convention of the Society of Industrial Engineers, at the Stevens Hotel, Chicago, May 24 to 27.

The papers presented were: "Training for the Practice of Industrial Engineering," by Wyeth Allen, consulting engineer, Milwaukee; "Industrial Training for College Graduates," by C. S. Coler, of the Westinghouse Electric and Manufacturing Co.; "The Function of a Course in Production in a Commerce Curriculum," by A. G. Anderson, of the University of Illinois; "The Trend of Science in Management," by Dexter S. Kimball, Dean of the college of engineering, Cornell University; "The Industrial Staff as a Principle of Effective Management—Its Part in Developing the Human Factor," by C. E. Knoeppel, manager director of Waste Eliminators, Inc.; "The Foreman and His Job," by T. B. Fordham, works manager of the Delco Light Co.; "The Five-Day Week," by Arthur H. Young, of Industrial Relations Counselors, Inc.; "The President's Handbook on Distribution Matters," by Fred D. Hess; "Wastes in Distribution of Merchandise," by E. M. Skinner, vice-president of Wilson Brothers; "Training Records and Their Value to Industry," by D. P. Hoover, educational department of the Westinghouse Electric and Manufacturing Co.; "The Principles of Effective Management Applied to Office Work," by F. L. Rowland, manager of the personnel and planning department, Lincoln National Life Insurance Co.; "Development of Standard Practice for Time-Study Engineering," by T. R. Hough of Wilson and Co.; "How to Analyze Manufacturing Operations," by A. B. Segur, consulting engineer.

At the fatigue committee dinner, held on Thursday, the topics included: "Some of the Physiological Factors in Fatigue," by Prof. Howard W. Haggard, of Yale University; "Report of Progress on the Movement for the Reduction of Noise," by Prof. Henry J. Spooner, director of the Polytechnic School of Engineering, London, Eng.; and "Open Forum Discussion on the Report of the Investigation on Rest Periods," prepared by Prof. Geo. H. Shepard and Julian A. Joffe.

President W. F. Rittman was toastmaster at the anniversay dinner, at which past-presidents Wallace, Roe and Sheehan gave brief talks. Following the dinner, the Chicago chapter of the society presented an original satire on the five-day week, entitled, "Wotta Life."

Plant inspections were made on Wednesday, Thursday and Friday afternoons, including a visit through the Stevens Hotel, accredited as the world's largest hotel.

Dean Kimball, in his paper, said that for the first time in human history the problem of production has, in a measure, been solved, and predicted that engineers will make greater contributions to the problem of distribution than any other profession. "Modern industrial methods have removed many of the old industrial restrictions," said the speaker, "and for the first time in human history we appear to have solved in some measure the problem of production.

"I have no illusions as to the results we can accomplish and I have no belief that we can solve all the ills of our social and political life. But I do believe that if the engineer will apply to these problems, insofar as his training and experience may warrant, the same methods that have changed our entire outlook as to the production of wealth, he can make a greater contribution to the problems of distribution of the products and profits of industry than any other profession."

The address by Mr. Knoeppel was based on replies to over 1,000 questionnaires sent to manufacturing companies. He said that American industry can double its productivity and triple its profits through recognizing the human as a spiritual force instead of as a physical entity, though looking upon him as reflecting a divine intelligence is right thinking. Industry inventories material and buildings and equipment but it fails to inventory human potentials and then use them. Failing to do so, it has not developed man's thinking to the extent that the future of the race demands. In this great work, the industrial engineer has as much pioneering ahead as was the case when Taylor, Gantt and Emerson, the "big three" of industrial engineering, began their great developments that have meant so much to industry.

In his consideration of the merchandising problem, Mr. Hess used the analytical method employed by engineers which has done so much to perfect the production side of industry. It deals with such matters as the class of advertising a certain kind of concern should use. Waste in advertising due to promiscuous advertising, such as advertising nationally when the trade is most local, were indicated, and thorough analysis of these phases of distribution problems were presented.

In his address Mr. Hoover, of the Westinghouse company, said in part: "The increased efficiency of machinery, production and distribution methods demand that the efficiency of the personnel in industry be increased proportionately. The finest kind of machines and the greatest amount of horsepower is of no value unless it can be controlled. This condition has become so apparent that between 20 and 30 per cent of the employees in our company are taking some kind of training, either on the inside or outside, to be prepared to handle the increased power at their command." The paper included an outline of the records necessary, how they should be arranged, and the method of securing and keeping them up to date.

In discussing the analysis of manufacturing operations, Mr. Segur brought out the importance of exact knowledge as the basis for rate determination and establishment of efficient operations, and the necessity of having a means to check back the actual conditions existing during the study.

Based on the work of the Gilbreths, who developed motion study by the use of the micro-motion methods made possible by motion pictures taken under carefully planned conditions, and scientific analysis of results, Mr. Segur showed how, by the use of what he terms "motion-time study," it is possible to note incorrect operation methods which cannot otherwise be noted by even the most experienced time-study expert who uses the stop-watch method. To demonstrate the superiority of micro-motion analysis over the stop-watch method, a comparison was staged at the meeting, at which time experts of the stop-watch method made a study of the operations involved in refilling an automatic pencil. Mr. Segur emphasized the attainment of the best method of operation rather than attempting primarily to obtain the best rate, pointing out that not only is the former procedure more equitable to the worker but also that it creates a greater yield.

The meeting place for next year's convention will be decided by the executive committee some time later in the year.

The newly elected officers are as follows: W. F. Rittman, of Pittsburgh, was re-elected president. E. A. Rummler, of Chicago, was elected treasurer, and George C. Dent, of Chicago, was re-elected secretary.

Foreign Trade Experts Agree That Reciprocal Treaties Are Workable

Chairman Farrell warns against uneconomical tariffs

"RECIPROCAL trade treaties are just as applicable and just as workable as free trade or protection," was the way Eugene N. Foss, president of the B. F. Sturtevant Co., expressed the idea which came close to being the theme of the majority of the sessions of the fourteenth national foreign trade convention at Detroit last week. Mr. Foss took the place of Secretary of Commerce Hoover at the luncheon which was the only social event of the busy session. He described the present situation of manufacturing in Massachusetts, with the steel industries moving away, the cotton mills closing and the woolen mills in severe straits. He said that the New England manufacturers had sent lobbyists to Washington, influenced legislation in every way they could to get protection for their industries, and "now we are getting what is coming to us."

It was a good Democratic speech, in that it was anti-protection, but it was the more significant than that, because it reflected the atmosphere which was present in virtually every meeting, both of the general sessions and of the important group sessions. The questions that came up were of interest to the foreign buyer, and the foreign delegations and the American experts who spoke of specific markets reiterated again and again the need of opening this great market for the commodities of other nations, as a means for opening their markets in a friendly way to American manufacturers of machinery and of textiles.

The Canadians put over the reciprocity idea with thorough skill, and Governor Foss, stating that from 1854 to 1856 we had a reciprocity treaty with Canada which if it has not been abrogated (for political and not for economic reasons, he said) our manufacturers would not be setting up branch factories today in Canada. The Latin American market was mentioned again and again and almost as often characterized as the great opportunity of American exporters, chiefly for machinery of an infinite number of varieties. To quote Governor Foss again, "We get only about 25 per cent of the import trade of Latin America—and they are at our doors. If we could put our arms around them and allay their distrust we would not need to look anywhere else." Governor Foss endorsed the motto of the Argentine Rural Society, voiced at the conference an hour before the luncheon, in the words "We buy from those who buy from us."

The Latin American position was presented by Dr. Luis Duhau, of Buenos Aires, president of the rural society, who made a sensational speech on the same subject at the Pan American Commercial Congress in Washington on May 3. Dr. Duhau's address at Detroit was a more concise and studied document than his Washington speech, and probably reflects very definitely the present Argentine attitude toward the United States, although he did not mention the fact that the average Argentine duty on American imports is 32 per cent while the average duty of the United States on Argentine exports is about 20 per cent.

The reciprocity idea was not always favored, as such, however, but there was no lack of uniformity of opposition to the trade barriers which are one of the reasons for the growing talk of reciprocity treaties. So great an authority as Julius Barnes, president of the Barnes-Ames Co., and ex-president of the Chamber of Commerce of the United States, took his stand in these words:

"When economists assert that, as in

1926, we cannot continue to sell to Europe $2,300,000,000 of goods and take from Europe only $1,300,000,000, we have a right to ask them how then we can take from Asia in the same year $1,400,000,000 of goods and send Asia less than $600,000,000. The truth is that these great trade currents break through the petty theories of shallow economists and in a world of natural influences inevitably find their balanced level to discredit theorists. The rising level of American individual possessions sends an increasing flow of eager appreciators of the Old World to carry their hundreds of millions of American dollars for expenditure there and the rising reservoir of accumulated American capital flows in adjustment loans to stimulate and secure a recovering Europe. This does not mean that we should not strive continuously and patiently and wisely to find the reasonable measure of protective influence, to eliminate trade barriers that serve no purpose but obstruction and prohibition, to create those fields of fair opportunity which stimulate individual and national effort in production and in commerce; but it does mean that we shall demand that the experience and ability which has led American industry to levels undreamed of in the past, shall be heard also in the realm of government and politics which touch the field of international trade."

The Detroit meeting brought together an immense throng of domestic manufacturers as well as those who already are in the arena of foreign trade. The group meetings were even more crowded with interested listeners than the general sessions, and the questions asked the speakers during the discussions indicated a deep personal interest in export.

In his address "The Foreign Trade Balance," James A. Farrell, chairman of the council, and president of the United States Steel Corporation, had considerable to say on the subject of threats from other nations to curtail their purchases from us, unless we bought more from them. He summed up his remarks by saying this:

"It is neither necessary nor wise for any nation to insist upon an even exchange of goods, with any and every other nation. What one buys anywhere enables the seller to buy where it finds its best advantage. It is the sum of all the purchases which balances with the sum of all the sales. The way to prosperity for the United States and for all other nations is along the line of increased production and lower cost.

"The international trade of the United States is growing steadily, and no doubt will continue to prosper as the purchasing and consuming power of the rest of the world gains. But our growth will not be fortuitous or gratuitous. It will be the result of our own intelligent effort. It is recognized that we possess industrial skill and enterprise in high degree, but that alone will not suffice. We must also see the international picture in perspective and not rely on our economic self-sufficiency. The development of our foreign trade is not only important, but essential to our national growth. It is a problem which calls for the co-operation of all concerned."

World Leaders Voice Disapproval of International Industrial Combines

American delegates make favorable impression

By Edward J. Mehren
Vice-President, the McGraw-Hill Publishing Company, Inc.

Geneva, May 21.—The recommendations of the Economic Conferences for restoring the economic health of the world, particularly that of Europe, all of which had been approved by the committees, were given final approval in the general session on Tuesday, May 17. The resolutions on industry cover rationalization, industrial pools and statistics.

The recommendation on rationalization, that is the application of all devices for reducing costs, urged that labor should co-operate to secure good working conditions and a fair share in the results. It also advised occupational selection, guidance and training for labor. There was further recommended a national and international standardization program for materials, parts and products to facilitate international trade. The education of manufacturers' workers regarding the advantages of rationalization also was urged.

Cartels Not the Remedy

Disagreement was quite general with regard to national and international industrial pools. They were believed to be good or bad according to results and their regard for the general interest. Their field of application is limited to branches of production already centralized and to products in bulk or of recognized grades, so that cartels alone are not able to remove European troubles. Where they are applicable, however, they secure more methodical organization of production, reduce costs through better utilization of existing equipment and develop new plants along better lines. Such group undertakings more rationally check uneconomic competition, reduce evils of fluctuating industrial activity and thus assure greater stability of employment. They also reduce production and distribution costs, making for lower selling prices and thus benefit the consumer. However, if pools encourage monopolistic tendencies and the application of unsound business methods they may check technical progress and incorporate dangers for the public. If pools are resorted to, they must not injure either the consumers or the workers nor restrict the supply of raw materials or basic products to any particular country. Neither should they create unequal conditions between the finishing industries of consuming and producing countries.

The control of national agreements by an international judicial scheme is impossible. However, national legislation can control the operations of an international agreement in home territories, although voluntary recourse to arbitral bodies is desirable. The League of Nations should study international industrial co-operations and their effects upon technical progress, production and labor prices and should publish such data. Such publicity would form an effective means for securing public approval and for preventing abuses.

In connection with industrial statistics, the conference recommended that international statistics be compiled on the supply of raw materials, on output, stocks, prices, wages and employment. It recommended a standardization of terms, methods and scope to begin with the basic world industries.

The resolutions on commerce were very long and deserving of careful study by all interested in foreign trade. They condemn export and import prohibitions and special privileges granted to state enterprises. The conference recommended a liberal policy toward foreign nationals and companies engaged in commerce and urged a simplification of customs and tariffs and a standard nomenclature. The stabilization of tariffs by means of long term treaties, referring chiefly to European countries, was also recommended. It was declared that hampering tariffs should be reduced, starting with those imposed to counteract the effects of war disturbances. It was recommended that the exportation of raw materials be not burdened by export duties.

All direct and indirect subsidies to home industries were condemned and dumping was declared harmful and out of all proportion to any temporary advantage from cheap imports.

The agricultural recommendations were based on the fact that agriculture is the occupation of a majority of the world's workers and that maximum industrial development is determined by the quantity of food and raw material which they produce. It was declared that an equilibrium must be re-established between the returns to industry and agriculture. Low farm purchasing power has reduced the demand for industrial products and the fear was expressed that unless a balance is restored decreased agricultural production will be detrimental. Welfare-making remedies suggested are a general adoption of a scientific organization of production, technical improvement and marketing, standardization of agricultural products and better credit systems all tending to reduce the cost of production.

Because American public opinion is opposed both to governmental participation in industry and to monopolistic tendencies, American delegates stated that while not opposed to resolutions on industrial pools they would abstain from voting thereon. There was no criticism or animosity to America and no evidence of a European combine against America. The contribution of American delegates was much appreciated for they took the position that they were here to help give the data requested regarding our experiences, but not to tell Europe what to do.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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INFLATION is a factor that is so insidious in its operation that its effect is generally felt before its presence is recognized. Its recognition is, in fact, often coincident with the crest of the boom that it has caused, for its perils are so well understood that "to be shunned it needs but to be seen."

These observations are prompted by the recent advance in cotton and last week's excitement in the grain markets, where wheat and corn rose sensationally and reacted abruptly.

In the earlier stages the advance in the commodities named was due to the fear of crop curtailment as a result of floods, bad weather and reduced acreage, but as prices mounted to heights that over discounted seasonal influences many have begun to ask whether merchandise values were not at last commencing to reflect the plethora of credit that has for so long sustained the upward movement in stocks and bonds.

Commenting on this aspect of the question the dean of America's financial editors wrote as follows in the *New York Times* last Wednesday:

"This shift of speculative buying to the grain market has the particular interest created by the fact that the state of the credit market, which for numerous reasons has not occasioned speculation in other industrial products has all along had free play in grain and cotton, as in real estate and on the Stock Exchange. In cotton, the rampant upward movement was beaten down only by production of unprecedented magnitude; but wheat, since the brief period after the European harvest shortage of 1924, has seemed to lose touch with speculative influences. It is not improbable that the market's present action means that grain is being affected by the prevalent spirit of the day. No one will grudge the farmer the resultant benefit. It should be considerable, even so near the end of the grain-marketing season, when the amount of wheat held on the farms in March was 30,000,000 bushels greater than a year before."

If the suggestion implied in the remarks quoted is warranted then it will not be long until the infection of inflation spreads to all the markets, with the result that merchandise of all sorts as well as real estate and securities will be advanced to dizzy heights. But the public is not yet ready to accept this diagnosis, and until it is accepted or disproved there is nothing in sight to check the spread of the speculative enthusiasm that is manifest in so many directions.

The market for railroad stocks, which was temporarily halted by the action of the Interstate Commerce Commission in vetoing the Loree rail merger is again bounding upward upon a report that President Coolidge is in favor of railroad consolidation. But the industrial shares have not been so strong. The oil stocks have been rather weak because no agreement to control production has as yet been arrived at and some idea of the resulting decline may be had from the statement that the stocks of thirty important oil companies listed on the New York Stock Exchange are today worth $559,000,000 less than they were worth at the high point of 1926.

The motor stocks are also lower upon Ford's announcement that his new car would soon be ready and the production figures for April, which show that the output for that month included 397,566 cars of all sorts as against 430,523 in April 1926.

The oil and motor industries are, however, the only two in which under consumption is throttling production and it remains to be seen whether the disparity between capacity and demand will spread. If it does, even inflation cannot avert some unemployment. The steel industry is working at about 85 per cent of capacity, which is probably normal, as capacity production is a theoretical maximum that is rarely attained.

Copper has been so successfully stabilized that it hardly moves at all, though the demand is large. The woolen manufacturers are complaining bitterly, but their outcry has not increased the distribution of their fabrics and some are commencing to say that closed automobiles with better heated houses, offices and factories have reduced the consumption of woolen clothing.

Cotton goods are a shade firmer, but sales have been restricted by an erratic market for the raw material, which seems to have over discounted the flood damage and is reactionary.

In the news from Europe, Great Britain's break with the Soviet Trade Commission takes first place. The "subversive" acts that led the British government to give the Russians their "walking papers" are set forth in detail, but some Englishmen, including Lloyd George, seem to think that their gravity has been exaggerated and that partisan politics are behind the issue raised.

It is plain that conditions in the Far East are out of joint and that business there is becoming more difficult. But these details are noted more as a matter of record than because they have any bearing upon our own situation which continues to be superficially placid, although it contains some subsurface elements that may give trouble later on.

WHAT'S DOING IN INDUSTRY

EXAMINATION of reports from several of the important industrial centers of the country reveals little change from the desultory activity in machinery and machine tools. This condition has prevailed for many weeks, broken now and again by a spurt in some particular locality that was only temporary. The general trend of business is even at this time, but the receipt of some promising inquiries holds out hope for an upward turn in June.

IN CINCINNATI business is slightly better in a general way, and inquiries are very promising. Chicago reports a slight improvement in the demand from general manufacturers. Philadelphia also reports better business, some good orders being in prospect from automobile manufacturers and railroads.

NEW YORK dealers find a hesitancy in closing on the part of buyers of shop equipment, but current inquiries are encouraging. Sales and general activity in Canada continue to run ahead of the record of last year. In the South, textile and construction machinery are doing nicely and there is prospect of some good railroad business.

THE SITUATION in the general business world continues to be superficially placid, although it contains some subsurface elements that may give trouble later on.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

SOUTHERN DISTRICT

Adverse conditions affecting industrial operations in the southern district are still keeping machinery and equipment sales lower than dealers had expected, for while there has been a fair volume reported for the last two weeks business is not as large as last year at this time, nor does it promise any material improvement in the immediate future. One or two lines are fairly active, mainly road building machinery and textile equipment, but as a whole business is off.

The railroads are placing a few good orders for heavier equipment to be used in various shop construction projects underway in the Southeast, but not buying as largely as at this time last year. Woodworking and sawmill equipment is only fair where the trade had expected it to be brisk by this time, a majority of the sales being to furniture companies erecting new plants; other woodworking sales are largely of used or rebuilt machinery. Brick making equipment is also comparatively dull at this time for the industry has suffered a period of depression so far this year and has been doing little building or improvement work. Contractors' machinery and equipment is fair in larger cities but off elsewhere as there is less than a normal volume of new construction being done in this territory.

Textile equipment is one of the most active lines right now as there is a considerable amount of new mill construction in progress, and there is every promise that this business will continue active through the spring and summer months. Smaller machine shops and garages and service stations are buying very little, and such buying as they are doing is largely in the used or rebuilt machinery market.

CANADA

Buying of machinery and machine tools in Canada continues at a rate considerably in excess of that of the same time last year. Increased purchases are reported by dealers as coming from practically all industries, but notably the railroads and automotive plants, both on replacement and extension accounts. The Canadian Pacific Railway, it is reported, will soon be in the market for a considerable amount of machine tools, to be utilized at both western and eastern points.

The Canadian Car and Foundry Co. has received an order for tram-cars from the Brazilian Traction, Light, Heat and Power Co., for use in South America. The Dominion Engineering Co. has received orders for hydraulic machinery from the Quinze Power Co. for the installation of a 26,000 hp. unit. The four-machine project of the St. Regis Paper Co. is also looked upon as potential new business for Dominion Engineering, which has just complete the four machines for the International Paper Company's Gatineau mill.

Canadian Steel Foundries recently received an order from General Motors for 40,000 Chevrolet frames. The English Electric Co., and its Canadian subsidiary, Crocker Wheeler Co., report profits for the past year far in excess of any year since the formation of the companies, arising principally from work secured from the pulp and paper, mining and power generating industries

Building and construction is at an unusually high level, with a consequent increase in demand for builders' hardware and equipment. For the year to date, engineering construction permits have amounted to over $14,000,000, and industrial undertakings to over $12,000,000.

NEW YORK

A number of fairly large inquiries from industrial firms has helped to build up a better feeling in this market. Sales during the past week have been rather slow. Many orders of a substantial character are on the books of dealers, but official confirmation keeps them from being sent to the factories. Industrial readjustments are probably responsible for most of the tardiness in closing business.

Among the lists that arrived during the week was a sizeable one from the American Smelting Co. and another from a large automobile manufacturer. The General Electric Co. is still buying for its refrigerating plant. Railroad activity is slowing up.

One order placed in the last few days called for 6 vertical shapers. Another was for three 16-in. lathes. Large equipment orders included a 400-ton wheel press and a 100-ton bushing press.

PHILADELPHIA

A slight increase in orders in some lines of the machinery and machine tool industry was noted by dealers in the Philadelphia market during the last ten days, while others reported continuance of the dull period. Some orders from shop equipment have been placed by one or two of the automobile companies, but the purchases were for replacements. Inquiries have been received from general industrial lines, some of which indicate orders will be placed.

There has been a slight improvement in the business of engineering firms engaged especially in repair work, some of the railroads having been customers and some small purchases were made by carriers for replacements. One large firm specializing in gears for general industrial purposes reported business had fallen off about twenty-five per cent compared with this time last year.

Producers of heavy equipment used by railroads are anticipating early publication of lists from Southwestern lines, now that flood conditions have improved.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that while business was irregular in the past week the daily average of sales was slightly larger than in the previous week. While the past month's sales total was not as large as some had hoped, a gain was made over the previous month by the majority of the concerns.

Selling agents report that the local market for machine tools of all varieties is getting livelier, with a diminishing sales resistance. While no large orders were received in the past week, there were enough small ones booked to make up an increased daily average.

The feature of the past week's business was the purchase of replacements and single tools by small machinists and general users. Orders came from all parts of the country and were well diversified as to size and type. Railroads made some purchases of single tools, from lists that have been out some time. Automobile and accessory manufacturers bought more than in the previous week.

Inquiries came in freely during the week, from all sections of the country, for all kinds of single tools and replacements, and it is thought that enough sales should develop from these to maintain business at a good level. The great majority of the manufacturers and sales agents express the opinion that a better market is developing and expect the business trend to be upward through June.

NEW ENGLAND

Business in the machine building industry in the Connecticut section of New England showed a slight favorable change during the past week. There was an increase in the volume of inquiry mail and steady buying. Entering the last month of the second quarter the general feeling is that the total will equal the first quarter and compared with a year ago show slight improvement such as has steadily been going ahead.

There are substantial evidences of further revival. The plant of the Rowe Calk & Chain Co. at Southington, is to be sold and manufacturing will be resumed; the Crane Co. of Bridgeport is building a large plant addition and the Bridgeport Metal Goods Co. has expansion work in progress; the Philbrick-Booth-Spencer Foundry Co. is doubling its plant in Hartford; a reorganization of the Billings & Spencer Co. of Hartford progresses; the Torrington Company of Torrington has bought the Chicago Handlebar Company of Shelby, O., and will use 75 additional employees.

CHICAGO

Conditions in the machine tool industry remain featureless. Here and there a dealer or a manufacturer's representative tells of an improvement over the last two or three weeks in the matter of sales, but in the main the machinery business continues on a low level. The slight renewal of activity due to the closing of several of the remaining items on the lists of the Santa Fe and Union Pacific railroads and the Illinois Steel Co. has seemingly subsided, and with no new lists in immediate prospect the near outlook is not regarded with optimism by the trade.

Increased demand from general industrial sources is indicated, however, by the volume and character of the inquiries being received, and should the automotive industry, which includes accessories and parts, come up to the expectations of a gradually increasing output of cars and trucks, the demand for machine tools will likely be stimulated.

In general, the business reported for May is about on a par with that of April. Dealers in used tools refer to trade as dull, in consequence of which some price cutting has entered into the competition for such business as is in sight.

Automotive Engineers at French Lick Study New Construction Problems

Washington section wins assembly contest

AN INTER-SECTIONAL chassis assembling contest was one of the features of the four-day summer meeting of the Society of Automotive Engineers, held at French Lick Springs, Ind., May 25 to 28. Seven teams competed in this contest, which required the complete assembling of a Chevrolet truck chassis, putting it in running order and driving it off the track. The contest was won by the team of the Washington Section, which finished far in the lead.

Other features were the reports of the various committees which have been working on S.A.E. Standards.

After the standards committee meeting of which K. L. Herrmann was chairman, the general session, with president J. H. Hunt in the chair, opened with an address by Dr. E. F. Barker on the structure of the atom and a splendid talk by Dr. C. H. Robertson on economic conditions in China.

Members of the S.A.E. are invited to attend an international meeting of the engineers and manufacturers of Great Britain in November, 1927, as well as an exhibition of motor vehicles for world transportation, to be held at the same time. The meeting also cabled a message of hearty congratulations to Captain Lindbergh in Paris. An amendment adding to the nominating committee of the S.A.E. was passed and the three additional members named.

"High-Speed Rattle"

E. S. Marks presided at the chassis session at which S. O. White, chief engineer of the Warner Gear Co. discussed an internal-geared, four-speed transmission. Intensive study of vibrations, made to prevent what is known as "high-speed rattle," has found this to be due to periodic vibrations in the engine and propeller shaft. It is felt that much of this can be obviated by using a "fast" axle, or one with a low ratio, so that crankshaft and propeller shaft speeds can be reduced at usual road speeds.

The four-speed transmission offers a solution by giving closer steps between the various speeds. Spur gears have, however, proved noisy in such transmissions, but the recent developments in internal-geared transmissions give a reasonably quiet third speed and give a high road speed with low engine speed in the fourth position. Analysis shows that most cars today run their engines at too high speeds to secure the most advantageous torque and that this causes excessive periodic vibration, noise and wear as well as unnecessary fuel and oil consumption. The relation of various axle ratios to engine horsepower were shown by charts. The paper was discussed by F. C. Thompson and others and cars with these transmissions were demonstrated.

A headlighting session was presided over by Dr. H. C. Dickinson, whose car was also used for demonstration purposes. The papers were "Factors Affecting Road Illumination," by R. E. Carlson and W. S. Hadaway; "Focussing Mechanisms and Adjustments," by A. W. Devine; "Double Adjustment Headlamps," by W. W. Matthews, and "Fixed Focus Headlamps," by C. C. Bohner. Both indoor and outdoor demonstrations showed what is being done along these lines. It is also gratifying to note the co-operation that is taking place between highway commissions and manufacturers.

The research session, with R. E. Wilson as chairman, was of special interest. W. S. James spoke on the "Relation of Research to Industry"; D. C. Ritchie on "Lean Explosive Mixtures for Hydrocarbon Fuels"; J. O. Eisinger on "Engine Acceleration Tests;" Dr. M. R. Schmidt on "Specifications for Petroleum Lubricants;" C. W. Spicer on "Strength of Spline Fittings."

Mr. Eisinger presented data on the influence of carbureter characteristics, jacket-water temperature, intake air temperature, air fuel ratio, injection of an accelerating change and initial engine speed, or the engine acceleration.

Mr. Spicer went into great detail and presented several illustrations. Twenty specimens were ground to a fine finish all over for the long spline tests and five for the short spline. The tests shown indicated great care in securing data and the paper was a real addition to the knowledge available on this important subject.

At the engine session, oil flow through crankshaft and connecting rod bearings was discussed by S. W. Sparrow and Donald B. Brooks. Valve spring surge was presented by W. T. Donkin and H. H. Clarke. Body design was discussed by A. E. Northup. A session on brakes included papers on internal brakes by H. D. Church, brake lining tests by S. Von Ammon and A. M. Yocom, and brake testing and adjusting by F. W. Parks.

At the passenger car session D. C. Fenner and M. C. Horine discussed the effect of legislation on design, referring particularly to the passenger bus. P. B. Jackson described the experimental light weight cars built mostly of aluminum by the Pierce Arrow company.

French Propose Higher Tariff on Machinery

The new tariff bill under consideration in France embodies changes that are particularly interesting to American manufacturers and exporters of machinery and machine tools. The effect of this new tariff will be to make the importation of standard machine tools more difficult than it has been during the past few years. However, it should not greatly affect high-class machines, or types of special production machines. The duties, being based on weight, probably will penalize German and English tools more than those of American manufacture, as our pound price is considerably higher at this time.

A comparison of the present and proposed tariff rates follows:

Weight of Machines	New Tariff per 100 Kgs., Frs.	Old Tariff per 100 Kgs., Frs.
50,000 kgs. and more	110	56
From 25,000 kgs. to 50,000	145	56
From 12,000 kgs. to 25,000	170	67.20
From 3,000 kgs. to 12,000	190	67.20 and 89.00
From 1,000 kgs. to 3,000	215	89.60
From 250 kgs. to 1,000	250	134.40
From 100 kgs. to 250	300	280
Less than 100 kgs.	360	280

On the smaller types of precision machine tools, the average duty would be somewhere around 10 per cent of the selling price, and on heavy machine tools it would be somewhat under that. Small tools such as taps, dies, reamers, etc., now pay 20 per cent ad valorem. Under the new tariff, the duty would be 30 per cent ad valorem.

Dealers Meet at Granville

The annual spring meeting of the Associated Machine Tool Dealers was held at Granville, Ohio, on three days last week—May 25, 26 and 27. Most of the sessions were devoted to informal discussions of subjects of interest to dealers. Only two stated addresses were on the program. J. A. Smith, general superintendent of the Schenectady Works of the General Electric Co., and Mason Britton, vice-president and general manager of *American Machinist*, were the speakers. James R. Vandyck, president of the association, presided.

New Patent Regulations Now in Effect

A change in office practice in the United States Patent Office which will result in an important simplification of procedure with resultant benefits to American industry and trade was inaugurated this month. At that time the reorganized Board of Patent Appeals was established, as provided by an act of the last Congress, to function as the single patent appellate tribunal of the Patent Office and to replace the dual method of appeal formerly practiced.

Previously, the original appeal from office rejections was heard by the Board of Appeals, from whose decision appeal could be had to the Commissioner of patents. From the commissioner's decision, appellate jurisdiction was vested in the Court of Appeals of the District of Columbia. Under the reorganized plan it is designed that the single appellate tribunal will always include the commissioner or one of his assistants, sitting with two of the examiners in chief. Appeals from this body will, however, still be heard by the District Court of Appeals.

In commenting upon the operation of the new appellate system, Commissioner of Patents Thomas E. Robertson stated that it carried the hearty endorsement of the American bar and of the industry of this country.

Personals

FRANK B. SUPPLEE has been elected treasurer of the Gilmer Co., Tacony, Philadelphia, manufacturers of woven products.

G. E. WEARN has been appointed central sales manager of the Westinghouse Electric and Manufacturing Co. He will be located in New York.

FRED P. WILSON, assistant manager of the contract service of the General Electric Co., has been named manager of the department succeeding W. G. Ely, retired.

T. P. GAYLORD, acting vice-president of the Westinghouse Electric and Manufacturing Co., has been elected president of the Pittsburgh Chamber of Commerce by the board of directors of that organization.

ARTHUR DIXON and EARL M. HUNKER, Merchants Bank Bldg., Indianapolis, Ind., have been appointed sales representatives for the products of the Geuder, Paeschke & Frey Co., in the state of Indiana and the city of Louisville, Kentucky.

W. H. KISSAM has been appointed New York district manager of the steel department of Henry Disston & Sons, Inc., Philadelphia, Pa. Prior to affiliating with the Disston organization, Mr. Kissam was associated with the Cyclops Steel Company.

ISAAC BLACK, formerly manager of the sales division of the Russell & Erwin division of the American Hardware Corporation, New Britain, Conn., has been appointed general manager to succeed Benjamin A. Hawley, who died recently.

SAMUEL FRANKEL, formerly chief metallurgist and works manager of Alloys and Products, Inc., New York City, announces his connection with the Niagara Falls Smelting and Refining Co., Buffalo, N. Y., as chief metallurgist.

CHARLES BOND, president of the Charles Bond Co., Philadelphia, manufacturers of power-transmitting machinery, sailed Saturday, May 21 on the S. S. "Caledonia" for Glasgow. He will spend about six weeks in Scotland.

H. L. WILSON, 514 National City Bank Bldg., Cleveland, Ohio, has been appointed sales representative by the Geuder, Paeschke & Frey Co. of Milwaukee for the Cleveland district. He will handle the sales of pressed, stamped, and drawn sheet metal products.

W. S. MOODY, who has been in charge of the transformer engineering department of the General Electric Co. since its inception, has been appointed consulting engineer for all transformer departments of the company and for all departments of the Pittsfield works.

E. L. PARSONS, formerly district manager for the Ramsey Chain Co. of Boston, has been appointed by the Foote Bros. Gear and Machine Co. as district sales representative for Wisconsin and northern Illinois, with headquarters at 49 E. Wells St., Milwaukee.

LOYALL A. OSBORNE, president of the Westinghouse Electric International Co. of New York has been elected chairman of the National Industrial Conference Board. Magnus W. Alexander is president and William D. Baldwin, of the Otis Elevator Co., has been elected chairman of the board's executive committee.

Business Items

The B. & G. Machinery Co., of Indianapolis, has moved from 620 E. Washington St. to 936 E. Washington Street.

Gammons & Holman, manufacturers of reamers and milling cutters, have purchased a new shop at South Manchester, Conn. and will move there the latter part of June.

The Dickerman Hoist Manufacturing Co. has been organized by H. E. Dickerman, 20 years with the Chisholm-Moore Manufacturing Co., and V. J. Rumpler, 14 years with the same company.

The Richey-Whaley Machinery Co., 23 E. South Street, Indianapolis, Ind., has been appointed representative in the Indianapolis territory of the General Manufacturing Co., Detroit, Mich., manufacturers of power presses.

The G. C. Phillips Tractor Co., Birmingham, Ala., manufacturers and distributors of road building equipment, announces the formation at Montgomery, Ala., of the Southern Tractor Co., 407 Lee St., that city, as distributors in that district.

The Clark Brothers Co., Olean, N. Y., manufacturers of sawmill machinery, announces the opening at 27 Dartmouth Ave., Avondale Estates, Atlanta, Ga., of a new branch sales office to cover the southeastern states.

The S. Obermayer Co., Chicago, manufacturers of foundry equipment and supplies, announces the recent appointment of the Penhallegon Foundry Supply Co., Birmingham, Ala., as distributors of the Obermayer line in Birmingham and a part of the Alabama territory.

The Whiting Corporation, Harvey, Ill., manufacturers of foundry equipment, railroad specialties and cranes, announces the appointment of Brazelton, Wessendorf & Nelms, Inc., 317 Preston Ave., Houston, Tex., as distributors in the southeastern Texas territory.

The Lincoln Electric Co., of Cleveland, announces the appointment of the Wade Engineering Co., 1855 Industrial St., Los Angeles, Calif., as distributor of Lincoln products in California. This company maintains a branch at 69 Webster Street, Oakland, California.

The Riess Manufacturing Co., manufacturers of riveting machines, is moving its machinery from Indianapolis to Kokomo, Ind., and will occupy one of the buildings formerly used by the Apperson company. About one-tenth of the machinery has been placed and will be put in operation before other machinery is moved.

The Bantam Ball Bearing Co., Litchfield, Conn., held its annual meeting recently and elected the following officers: President and general manager, W. S. Rogers; vice-president, W. W. Gager; second vice-president, J. H. Krause, Jr. The company has under consideration plans for removing the business to Waterbury.

The Reynolds Electric Co., of Chicago, has issued a warning to the trade against the operations of an imposter who has been obtaining money and various pieces of electrical equipment under the pretense that he is an employee of the Reynolds company. It is reported that a man, thought to be the imposter, has been arrested in Chicago.

The Perkins Machine and Gear Co., Springfield, Mass., has purchased the buildings of the bankrupt Springfield Body Corporation in West Springfield and will equip them for the manufacture of gears and various domestic appliance parts and also a multicut machine recently introduced into automotive and other establishments engaged in metal manufactures. The purchase price was about $78,000, it is said.

The Racine Radiator Co., Racine, Wis., manufacturer of automobile, truck, and tractor radiators and cooling systems, has purchased 5¼ acres at Oklahoma Avenue and the Milwaukee Road tracks at Milwaukee, Wis., from the Filer & Stowell Co., and will invest approximately $100,000 in a new plant, 125 x 475 ft., to be ready Sept. 1. The transfer of operations is intended to facilitate service to Milwaukee customers and those in Michigan, Milwaukee having direct water communication across Lake Michigan daily.

The General Electric Co. has announced the election of three new vice-presidents: C. C. Chesney, manager of the Pittsfield works; W. R. Burrows, associate manager of the incandescent lamp department; E. E. Eveleth, manager of the Schenectady works. F. C. Pratt, vice-president in charge of manufacturing, will retire June 1 and H. F. T. Erben, assistant vice-president, manufacturing department, will retire the end of the year. President Swope and other officers were re-elected by the board. President Swope also announced the formation of an engineering council for the company, to be composed of: R. W. Rice, Jr., honorary chairman ex-officio; E. W. Allen, chairman; Elihu Thomson, A. G. Davis, W. R. Whitney, W. L. R. Emmet, C. C. Chesney, and C. E. Eveleth.

Automobile Output Is Increasing

April production (factory sales) of motor vehicles in the United States, as reported to the Department of Commerce, was 397,566, of which 353,071 were passenger cars and 44,495 were trucks, as compared with 386,841 passenger cars and trucks in March, and 430,523 in April, 1926. The totals heretofore published have been revised from July, 1921, to date because of corrections made by some manufacturers.

The report is based on figures received from 156 manufacturers in the United States for recent months, fifty-three making passenger cars and 121 making trucks (eighteen making both passenger cars and trucks). Data for earlier months include ninety-five additional manufacturers now out of business, while March data for twenty-three small firms, mostly truck manufacturers, were not received in time.

Forthcoming Meetings

American Foundrymen's Association. Annual convention, Edgewater Beach, Chicago, June 6 to 10. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Supply and Machinery Distributors' Association. Twenty-second annual convention with the **Southern Supply and Machinery Dealers' Association**, and the **American Supply and Machinery Manufacturers' Association**, on board the steamship *Noronic*. Boat leaves Detroit, Mich., June 13 and returns there June 17. George A. Fernley, secretary, 505 Arch St., Philadelphia, Pa.

Exposition of Engineering Developments. Under the auspices of the Association of Iron and Steel Electrical Engineers, in the Empire Bldg., Pittsburgh, June 13 to 18. John F. Kelly, general chairman, 705 Empire Bldg., Pittsburgh.

American Society for Testing Materials. Annual meeting at French Lick, Ind., June 20 to 24. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, 225 West 34th St., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Bldg., Cincinnati, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

PRICES are perceptibly weaker in coke, pig iron, scrap, and steel. Bars and structurals show improvement in demand, while buying in other directions is unmistakably slower. Fabricated non-ferrous metals declined during the last week in the principal centers, following the recent dull market in the raw material. Scrap of all descriptions displays downward tendency in price. Furnace coke is a trifle under the May 20 level. The principal hot-rolled steel materials continue at $1.80@$1.90 per 100 lb., Pittsburgh mill, for plates and shapes, base sizes, with bars holding at $1.85@$1.90.

(All prices as of May 27)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.20@2.25	3.50	3.25	3.89
No. 12	2.25@2.30	3.55	3.30	3.94
No. 14	2.30@2.35	3.60	3.35	3.99
No. 16	2.40@2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.55@2.65	3.75	3.25	4.00
No. 22	2.70@2.80	3.90	3.40	4.15
No. 24	2.75@3.00	3.95	3.45	4.20
No. 26	2.85@2.95	4.05	3.55	4.30
No. 28	3.00@3.10	4.20	4.70	4.45
Galvanized				
No. 10	3.05@3.15	4.10	3.95	4.25
Nos. 12 to 14	3.15@3.25	4.20	4.05	4.35
No. 16	3.25@3.35	4.30	4.15	4.45
No. 18	3.40@3.50	4.45	4.30	4.60
No. 20	3.55@3.65	4.60	4.45	4.75
No. 22	3.60@3.70	4.65	4.50	4.80
No. 24	3.75@3.85	4.80	4.65	4.95
No. 26	3.95@4.05	5.05	4.90	5.20
No. 28	4.20@4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛", 8.35c.; ¼", 7.85c.; ⅛" to ½", 7.35c. per lb. *Flat, 1/16@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic, up to carlots, New York	13.87½		
Tin, pigs, 5-ton lots, New York	69.50		
Lead, pigs, up to carlots, E. St. Louis	6.15	New York	7.12½
Zinc, slabs, up to carlots, E. St. Louis	6.00	New York	7.00

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	16.00	....	15.00
Copper sheets, base	21.75	21.50	21.75
Copper wire, base	18.62½	18.25	18.50
Copper bars, base	21.37½	21.25	21.37½
Copper tubing, base	23.75	24.25	23.75
Brass sheets, high, base	18.12½	17.75	18.12½
Brass tubing, high, base	23.00	22.62½	23.00
Brass rods, high, base	15.87½	15.62½	15.87½
Brass wire, high, base	18.62½	18.25	18.62½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11.25	11 30	11 36
Solder (½ and ½), (case lots)	41.00	42.50	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			85.00
Commercial genuine, intermediate grade			61.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			13.00
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00 Electrolytic 39.00		Shot	36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.25 @11.50	10.75	9.75@10.25
Copper, heavy, and wire	10.50 @11.00	11.00	9.00@ 9.50
Copper, light, and bottoms	9 25 @ 9.75	9.50	8.00@ 8 50
Heavy lead	5 00 @ 5.25	5.25	4.50@ 5.00
Tea lead	4.00 @ 4.25	3.25	3 00@ 3.50
Brass, heavy, yellow	7.25 @ 7.50	7.00	6.50@ 7.00
Brass, heavy, red	9.00 @ 9.25	9.50	8.50@ 9.00
Brass, light	5.25 @ 5.50	6.00	5.50@ 6.00
No. 1 yellow rod turnings	7.50 @ 7.75	7.50	6.50@ 7.00
Zinc	4.00 @ 4.25	3.00	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0. 10@0. 13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@ 17
Wiping cloths, washed white, per lb	.15½	36.00 per M	.15
Sal soda, per lb	.02½	.02	.02¾
Roll sulphur, per lb	.02½	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.87½	.99	.90
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.55	50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	35	.29
Belting—Present discounts from list in fair quantities (¼ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb	.04	.04	.04
Brass rods	per lb	.1587½	.1587½	.1662½
Solder (½ and ½)	per lb	.41	.415	.385
Cotton waste, white	per lb	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal	.55	.55	.55
Machine oil	per gal	.33	.33	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9. 15	10. 71
*Emery cloth	27.84	27. 85	27. 84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.29	1. 27	1. 32
Cloth	3.10	3. 05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.65@3.00
Coke, prompt foundry, per net ton	Connellsville,		4.00@4.50
White lead, dry or in oil,	100 lb. kegs	New York,	15.25
Red lead, dry,	100 lb. kegs	New York,	15.25
Red lead, in oil,	100 lb. kegs	New York,	16.75

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1¼ and 1½ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Coach and lag screws:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Tap bolts, hexagonal heads	45%	
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	
Case hardened, hexagonal, tapped, in packages	30%	
Washers: Deduct from list, per 100 lb	$1.50	$3.50
Rivets, button and cone head:		
Small, including 7/16-in. dia		50–10%
Large (base) per 100 lb	$6.50	$5.00

EXTRA per 100 lb. on rivets, for ¼-in. dia., 35c.; ⅜-in., 15c.; ½-in., 5c.; length ½-in. and shorter, 25c.; longer than ½-in. up to and including 1¼-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Ill., Springfield—Division of Architects and Engineers, Capitol Bldg., will receive bids until June 21 for miscellaneous equipment for furniture factory at State Penitentiary, Stateville, Ill.

Mass., Revere (Boston P. O.)—Suburban Gas & Electric Co., 150 Beach St.—miscellaneous tools and equipment for proposed garage and repair shop. Estimated cost $50,000.

Mass., Roxbury (Boston P. O.)—G. F. Golub, 12 Garden St., Boston—miscellaneous tools and equipment for proposed repair and service garage here. Estimated cost $50,000.

Mass., Waltham (Boston P. O.)—Waltham Shade & Screen Co., 62 Bedford St.—single spindle boring mill, arm sander, movable head.

Mo., St. Louis—E. W. Anderson, 5345 Nagel Ave.—wood turning lathe.

N. J., Linden—Bd. of Education,—lathe, planer, joiner, bank saw, etc., for proposed 3 story, 200 x 350 ft. junior high school. Estimated cost $500,000.

N. Y., Buffalo—Donner Steel Co.—one jib crane and one 3 to 5 ton electric hoist.

O., Bellevue—Ohio Cultivator Co.—one 42 in. Bullard boring mill.

O., Lancaster—Lancaster Tire & Rubber Co., 168 East Long St., S. Miles, Supt., Columbus — three molding machines, two tire making machines and three vulcanizers for plant, here.

Pa., Pittsburgh—Bd. of Education, Fulton Bldg.—three 9 in. lathes, one 14 in. and one 20 in. drill presses, one 12 in. shaper and one 10 in. grinder for Knoxville Junior high school.

Ont., Hamilton—Kilgour Planing Mills, Aurora St.—prices and catalogs on new equipment to replace fire loss. Estimated cost $40,000.

Ont., Oshawa—General Motors, Ltd.—electric crane, 70 and 27 ft. span for proposed 200 x 400 ft. motor building. Estimated cost $750,000.

Opportunities for Future Business

Calif., Los Angeles — City will soon award contract for the construction of machine shop and garage.

Calif., Pittsburg—Pittsburg High School Dist. will soon award contract for the construction of shops, etc.

Calif., Richmond—Parsons Casket Hardware Co., Belvidere, Ill., awarded contract for the construction of first unit of factory, 1 story, 50 x 100 ft. at Tenth St. and Chanslor Ave., here.

Ill., Chicago — S. L. Malato, 155 North Clark St., awarded contract for the construction of a 6 story, 88 x 150 ft. garage at 5050 Broadway. Estimated cost $400,000.

Ill., Chicago—Ramp Building Corp., 21 East 40th St., New York, N. Y., will soon receive bids for the construction of a 10 story, 100 x 125 ft. garage at 318-28 Federal St., here. Estimated cost $1,200,000. A. S. Alschuler, 28 East Jackson Blvd., Archt.

Ill., Springfield—Henson-Robinson Hardware Co., 812 East Adams St., plans the construction of a 3 story, 44 x 60 ft. factory at 112-114 North 5th St. Estimated cost $40,000. Private plans.

Ind., Indianapolis — Insley Mfg. Co., W. H. Insley, Pres., 801 North Olney St., had plans prepared for the construction of a machine shop at East St., Clair St. and Bell Ry. Estimated cost $143,000. Private plans.

Ind., Indianapolis—A. Paetz, 33 West Maple Rd., had plans prepared for the construction of a 1 story, 52 x 112 ft. machine shop and garage at Salem and Maple Rds. Estimated cost $43,000. G. V. Beddell, Aetna Trust Bldg., Archt.

Ind., Indianapolis—Stone Auto Co., 536 East Washington St., had plans prepared for the construction of a 2 story, 50 x 195 ft. machine shop and service station at 540 East Washington St. Estimated cost $42,000. G. V. Beddell, Aetna Trust Bldg., Archt.

Ia., Marshalltown—Cooper Mfg. Co., 411 South First Ave., manufacturers of auto heaters, awarded contract for the construction of a 1 and 2 story, 38 x 150 ft. factory. Estimated cost $40,000. Noted May 26.

Mass., Beverly Farms—Trowt & Murray, 715 Hale St., awarded contract for the construction of a 1 story repair and service garage. Estimated cost $40,000. Noted Apr. 7.

Mass., Brockton—City Hall Sq. Garage Co., East Elm St., will build a 2 story repair and service garage. Estimated cost $100,000. F. A. Norcross, 46 Cornhill, Boston, Archt. Noted Mar. 31.

Mass., Revere (Boston P. O.)—Suburban Gas & Electric Co., 150 Beach St., awarded contract for the construction of a 1 story, 55 x 105 ft., garage and repair shop. Estimated cost $50,000. Noted May 12.

Mass., Roxbury (Boston P. O.)—Troy Dyeing & Cleansing Co., 176 Shirley St., awarded contract for the construction of a 1 story garage and repair shop on Langdon St. Estimated cost $45,000.

Mass., Watertown (Boston P. O.)—K. Duffy, 15 Hinnewell Ave., Brighton, awarded contract for the construction of a 1 story garage and repair shop on North Beacon St. here. Estimated cost $40,000.

Mass., Wellesley (Boston P. O.)—Wellesley Colonial Garage Inc., c/o Blackall, Clapp & Whittemore, 31 West St., Boston, Archts., is receiving bids for the construction of a 2 story, 105 x 140 ft. repair and service garage at Linden and Central Sts. here.

Mo., Kansas City — Southwestern Bell Telephone Co., 11th and Pine Sts., St. Louis, awarded contract for the construction of a 1 and 2 story, 120 x 180 ft. and 108 x 144 ft. garage at 35th St. and Roanoke Rd., here. Estimated cost $285,000. Noted Apr. 21.

Mo., St. Louis—R. E. Burdeau Co., 801 Chestnut St., will build a 1 story, 80 x 210 ft. garage and service station on Lalede Ave. Estimated cost $60,000. J. T. Craven Engineering Co., Century Bldg., Archt. and Engr.

Mo., St. Louis—F. Dubinsky, Wainwright Bldg., awarded contract for the construction of a 1 and 2 story, 155 x 165 ft. garage, at Iron St. and Grand Blvd. Estimated cost $150,000.

Mo., St. Louis—Eighth and Morgan Sts. Garage & Filling Station, Inc. J. H. Bawden, Pres., awarded contract for the construction of a 5 story garage. Estimated cost $300,000.

Mo., St. Louis—Mound Coffin Co., 2000 North Second St., awarded contract for the construction of a 4 story, 65 x 75 ft. addition to factory. Estimated cost $60,000.

Mo., St. Louis—A. Von Hoffman, 101 South Ninth St., awarded contract for the construction of a 1 story, 125 x 198 ft. addition to garage at Ninth and Walnut Sts.

N. H., Nashua — City, P. D. Sargent, Mayor, awarded contract for the construction of a 1 story, 60 x 200 ft. and 50 x 50 machine shop and garage. Estimated cost $45,899.

N. J., East Orange—A. P. Smith Mfg. Co., 275 North Arlington Ave., awarded contract for the construction of a 3 story, 45 x 70 ft. addition to pattern shop. Estimated cost $50,000. Noted May 26.

N. J., Jersey City—American Can Co., 120 Broadway, New York, plans the construction of a 7 or 8 story, 200 x 900 ft. factory at St. Pauls Ave. and Dey St. Estimated cost $2,000,000. C. G. Preis, Ch. Engr. of American Construction Co., Archt. and Engr.

N. J., Jersey City—J. Begtrub, 3468 Hudson Blvd., had plans prepared for the construction of a 3 story, 50 x 90 ft. garage at Hudson Blvd. and Charles St. Estimated cost $150,000. W. Neuman, 40 Journal Sq., Archt.

N. Y., New York—Treasury Dept., office of J. A. Wetmore, Acting Supervising Archt., Washington, D C, will receive bids until June 21 for the construction of a garage at United State Quarantine Station here.

O., Cleveland—Hickox Electric Instrument Co., R. D. Hickox, Pres., 10514 Dupont Ave., awarded contract for the construction of a 2 story, 30 x 42 ft. addition to factory. Estimated cost $40,000. Noted May 26.

O., Cleveland—The Smith Incubator Co., W. A. Smith, Treas., 1920 West 77th St., awarded contract for the construction of a 1 and 2 story, 20 x 200 ft. and 200 x 265 ft. factory on Elmwood Ave. Estimated cost $175,000. Noted May 12.

O., Cleveland—The Weber Brass Co., L. A. Weber, Pres., 1111 Power Ave., plans the construction of a 4 story, 32 x 120 ft. factory at East 12th St. and Emerald Ct. Estimated cost $100,000. Architect not selected.

Pa., Blawnox — The Blaw Knox Co., manufacturers of steel, will build a 1 story, 100 x 160 ft. addition to plant. Estimated cost $50,000. Private plans.

Pa., Philadelphia—Felt Bros., Packard Bldg., awarded contract for the construction of a 1 story, 124 x 169 and 112 x 170 ft. sales and service station at Germantown Ave. and Bethlehem Pike. Noted May 12.

Pa., Philadelphia — I. Sley, c/o L. B. Rothschild, 215 South Broad St., awarded contract for the construction of an 8 story, 60 x 77 ft. garage at 1602 Chancellor St. Estimated cost $200,000. Noted Mar. 31.

Pa., Pittsburgh—Englert McKean Auto Co., 2134 Brownsville Rd., is having plans prepared for the construction of a 2 and 3 story, 80 x 100 ft. auto sales and service station on Bigelow Blvd. Estimated cost $150,000. M. Nirdlinger, Empire Bldg., Archt.

R. I., Pawtucket—Balkcom Brooks Co., 144 East Ave., is having sketches made for the construction of a 1 story repair and service garage. Estimated cost $40,000. Dwight-Seabury Co., 12 East Ave., Archt.

Wis., De Pere — De Pere Motor Co., George and Superior Sts., awarded contract for the construction of a 2 story, 50 x 120 ft. shop and service station. Estimated cost $40,000.

Ont., Kenora — Canadian Pacific Ry., Windsor Station, Montreal, Que., awarded contract for the construction of a 1 story, 52 x 82 ft. machine shop, here. Estimated cost $90,000. J. M. R. Fairbairn, Ch. Engr.

Ont., Peterborough—Western Clock Co., awarded contract for the construction of 3 story factory. Estimated cost $150,000. Noted April 7.

Ont., Saulte Ste. Marie—Algoma Steel Corp., will build a 1 story addition to steel rail mill. Estimated cost $300,000. Private plans.

Ont., Toronto—Toronto Battery Service Co., Ltd., 21 McCaul St., plans the construction of a 2 story, 62 x 126 ft. battery service building on Bay St. Estimated cost $150,000. N. A. Armstrong, 17 King St. E., Archt.